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United States Air Force

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Monthly Message

In the Summer 1959 issue of the *Yale Review* there is an article by Bertrand de Jouvenel,[1] French political philosopher, which was first delivered as one of the Storrs lectures at Yale. The title is "Ego in Otherdom." It is realistic, informative, entertaining, and filled with sound philosophy. "Ego" is man (you or I) and "Otherdom" the world into which man enters. A verisimilitude might well be the entrance of the young physician fresh from internship into one of the military services, hence my reference. The author states four axioms which are self evident:

1. Each man is conscious of moving within a highly organized field of forces and relations, here denoted as his Otherdom.
2. This field appears to him as one with a very low degree of randomness (chaos).
3. Man is capable of varying his behavior.
4. Every social system contains agencies working against the increase of entropy in the Otherdoms of its members. Entropy may here be defined as a change in static condition.

The application to the military is apparent: its organization based on traditions; its slow change; the courtesies, ethics and loyalties; and the sense of security experienced by each member. So much so that even among the regular forces members of one service feel far more at home and a part of that service than they do in one of the others, even though they may have close personal friends in another service. To go a step further, unquestionably this accounts for the great preference of members and families of one service when ill to go to one of their own hospitals. They "fit in" better and assume their own place more readily.

Unless there is complete unification of the military, not just a single medical service, there would soon develop a state of "comparative chaos or randomness" and what we know as "esprit" would disintegrate. To quote further, "The stability of Otherdom as I know it is made up of a general adherence of individuals to typical behaviors, the combination of which makes up the 'whole' as I know it. If all these individuals were to depart simultaneously in a notable manner from their specific typical behaviors, then Ego would find himself lost and wandering in an incomprehensible and unpredictable universe."

[1] de Jouvenel, B.: Ego in Otherdom. *Yale Rev.* XLVIII: 505–514, Summer 1959.

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From Hazelhurst to Brooks: A Saga of Aeromedical Pioneering

MAJOR GENERAL OTIS O. BENSON, JR., USAF, MC

MORE THAN FOUR DECADES have passed since the School of Aviation Medicine was born at Hazelhurst Field, near Mineola, Long Island, and American aviation has progressed from flimsy "crates" made of baling wire and canvas to sleek metal craft capable of fantastic speeds and heights literally out of this world.

Aviation medicine also has made startling progress over the years. Indeed, aviation medicine has made it possible for aviation in general to advance. This progress has been made possible through the talents and dedication of military physicians with vision, ability, and passionate determination.

The need for specialists in aviation medicine became obvious early in World War I, when the British discovered that out of every 100 pilot fatalities, only 2 were due to enemy action and 8 to airplane failure. Of the remainder, 30 died through their own carelessness or recklessness. The other 60 pilots were killed because they were physically unfit to fly in the first place.[1]

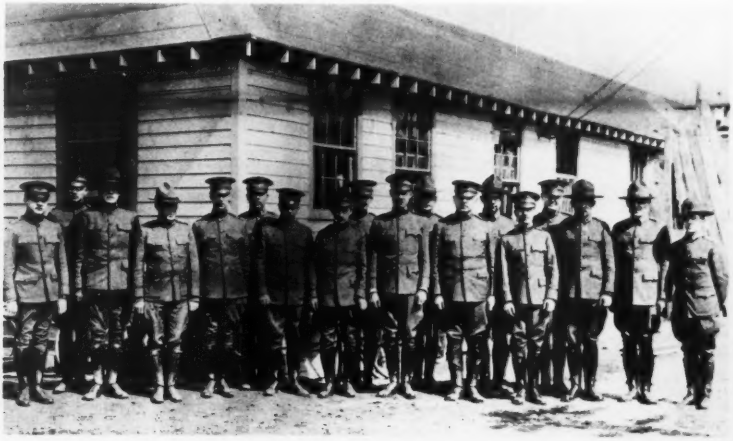
The necessity for some kind of specialized medical care for flyers was clear by the time America entered the war.

The need for pre-training examinations had been recognized for some time in the United States. In February 1912, the U.S. Army passed an order to all medical officers which stated: "All candidates for aviation duty shall be subjected to a rigorous physical examination to determine their fitness for such duty."[2] Two years later, Brigadier General (then Major) Theodore C. Lyster, MC, USA, began revising physical standards for candidate aviators. An ophthalmologist, he emphasized the importance of vision, ocular muscle balance, and the effects of refractive errors.

From U.S. Air Force School of Aviation Medicine, Brooks Air Force Base, Texas.

Shortly after America's entrance into the war, the revised physical examination for aviation training applicants appeared. Developed by General Lyster, together with Major Isaac H. Jones and Major Eugene R. Lewis, the new standards were arbitrary, as there were, as yet, no precedents to guide the physicians.[1]

The new criteria were quickly put to an acid test. Despite careful selection of students, the mortality rate from aircraft accidents among flying cadets climbed. Something had to be done to improve the situation, and on October 18, 1917, General Lyster, then chief surgeon of the Aviation Section, Army Signal Corps, appointed an



The staff of the Medical Research Laboratory, forerunner of today's School of Aviation Medicine, is shown in front of a laboratory building at Hazelhurst Field, Mineola, Long Island, in 1918. The building is typical of those which housed the institution in its early years.

Aviation Medical Research Board to investigate aviation medicine problems and conditions affecting the efficiency of pilots. The Board was to institute and carry out experiments to determine the ability of pilots to fly at high altitudes and to provide apparatus for the supply of oxygen to pilots flying at high altitudes.[2]

While construction of a research laboratory at Hazelhurst Field was under way, General Lyster went to Europe for a first-hand look at aviation medicine as practiced by the Allies.[3] In those days, a flyer had to ask his commanding officer before he could go on sick call, and many pilots chose to ignore or conceal their illnesses, rather

than run the risk of being thought cowardly. Those who survived the crashes—and there were many crashes—were immediately ordered to take up another plane. This was to see whether they still had the courage to fly. Whether they were physically or mentally fit to do so was apparently not given any great amount of thought.[3]

The four-story research institute of the new school houses the space division's one- and two-man space cabin simulators, the department of veterinary services, a high-level cobalt 60 radiation facility, the aeromedical library, and offices of the commandant and his staff.

General Lyster and his group returned from France, convinced that the medical problems of pilots were not understood. Experience overseas had shown him that medical officers were needed to keep a close and continuing watch on flyers, and to serve as advisors to their commanding officers.

Meanwhile, the new Air Service Medical Research Laboratory at Mineola had been completed and was in operation, commanded by Colonel William H. Wilmer. With a decompression chamber, research on human tolerance to lowered oxygen tension was begun and training of flight surgeons was started. In May 1918, this country's first 3 flight surgeons (the title had been adopted by the laboratory in 1918) were graduated, and by July the new facility had tripled in size and established branch laboratories to examine and classify pilots at 20 flying training fields throughout the United States.

In August 1918, General John J. Pershing cabled the Mineola laboratory for all the flight surgeons, medical technicians, and equipment it could send him. The entire facility, including the commandant, a mobile pressure chamber, and 14 tons of equipment, answered the call with such dispatch that the group was established at Issoudun, France, by early September.[3,4]

Colonel Wilmer's group found no change in conditions among American flyers in France, as General Lyster had noted during his visit. The physical status and mental attitude of the aviators was generally poor; pilots overindulged in food and drink and were not getting sufficient exercise. Perhaps most discouraging for the aeromedical physicians was the fact that there was still no medical check of pilots before flying, and they were compelled to obtain their commanders' permission before going on sick call. The accident rate was alarmingly high.

The flight surgeons immediately established a program of exercise, rest, and continual medical attention. Results were soon apparent: by October the accident rate had been reduced, morale was improved, and the pilots were more optimistic when they clambered into their planes for a hard day of flying.

Major Louis H. Bauer succeeded Colonel Wilmer as director of the laboratory in January 1919. The organization was now called the Medical Research Laboratory and School for Flight Surgeons. The two functions were separate, but were served by the same staff. Assigned personnel were responsible for conducting research in their specialties and for classroom instruction duties.

In March, Major Bauer was informed by telephone from Washington that a class of students would shortly be en route to his facility to be turned into flight surgeons. He quickly called his small staff together and after much debate devised a curriculum. The course was

Student officers in the primary course in aviation medicine attend a lecture in the 433-seat assembly hall of the new academic building.

to be 2 months long, and would include ophthalmology, otology, physiology, cardiology, psychology, neurophyschiatry, and physics. The first class to receive a regular course of instruction for flight surgeons began work in May.[5,6]

Classes were still being graduated when the laboratory moved to Mitchel Field, Long Island, the following November. In February 1921, the War Department recognized the School for Flight Surgeons as a special service school, coming directly under the Chief of the Air Service.[2] The title of the institution was changed again on November 8, 1922. The new name was the School of Aviation Medicine.

In the years to follow, many changes came to the institution, but the name and the training of flight surgeons remained constant. Although the title, length, and content of the course have all changed from time to time through the years, the training of flight surgeons itself has never been discontinued, despite shortages of money, staff personnel, or adequate space.

The course of instruction was recognized as one of great value almost from its inception, as is apparent from the wide range of student personnel it attracted. The Navy detailed medical officers to

the school for training until as late as 1939, when its own school was established in Pensacola, Florida.[2] Foreign medical officers have been permitted to attend the School of Aviation Medicine since 1923. After the Air Force became a separate service in 1947, the Army continued to send its officers to the school, and does so to this day.

The years 1925 to 1934 were slender ones for aviation medicine in America. The school's budget in 1926 was about 17 thousand dollars and by 1934 had dropped to 12 thousand dollars. At one point, the staff numbered only 6 officers, 8 civilians, and 4 enlisted men.[7,8]

In August 1926, the school was transferred from Mitchel Field to Brooks Field, to bring it close to the aviation cadet training center, then in San Antonio, where it was hoped more effective work could be accomplished in pre-training selection and aeromedical research. At Brooks, the small school was lodged in a corner of the "big balloon hangar," remaining there until mid-1927, when a permanent structure was completed for it.[7,8]

Observed by an instructor in ophthalmology, student officers prepare to use the facilities of a 16-chair eye lane in the aviation medicine examination wing of the new academic building.

During the 5 years at Brooks, the school occupied itself with administering physical examinations for flying personnel, and training flight surgeons. In 1931 the school was moved again, this time to newly opened Randolph Air Force Base, northeast of San Antonio.[9]

The new quarters at Randolph were larger and more modern, providing better accomodations for study and research. In 1932, Lieutenant Colonel Albert P. Clark, then commandant, directed that the institution's research be surveyed with the formation of an integrated program in mind. Ideas for 25 separate studies were proposed, a program that would have kept a large research facility busy for years.

One of the 16 modern classrooms located in the academic building. The seats are positioned to give each student an unobstructed view of the instructor.

With little equipment, a tight budget, and a small staff devoting almost full time to teaching, the school could do little toward implementing, much less completing, such a program.

Nevertheless, by 1934, some coordinated research was under way. It included psychologic testing, work on aviation goggles, vision in the aging pilot, night vision, cockpit lighting, color blindness, and the development of a kit for flight surgeons. Lack of trained personnel, funds, and a pressure chamber, prevented the staff from accomplishing much work in physiology.

Throughout the thirties, it was increasingly difficult to interest physicians in the course in aviation medicine. Public apathy concerning national defense and an "air corps" had a direct and demoralizing effect on aviation medicine. In 1935, flight surgeons were removed from flying status. Sixteen had been killed in aircraft mishaps, and now flight surgeons justifiably believed they were being required to accept the dangers of their chosen profession without due compensation.[7,8]

Four years later, the war in Europe began to alarm the United States. The country began to mobilize in 1940, and in April 1941, the School of Aviation Medicine expanded its program. Funds were obtained to build a second structure for the school at Randolph, and flight surgeons were restored to flying status.

Early in 1942, the school's research program was formally established by Brigadier General Eugen G. Reinartz, then commandant, with Major (later Major General) Harry G. Armstrong as its director. By the end of the war, more than 500 research projects were completed, including studies on color perception, night vision, the influence of aircraft noise and gunfire on hearing, the effects of carbon monoxide in cockpits, and decompression sickness.

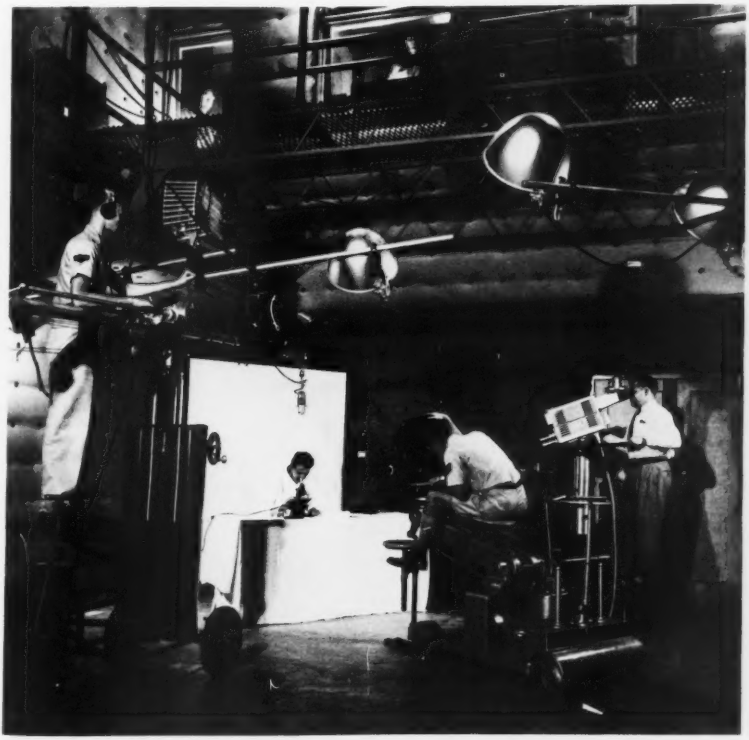
During the war, the school trained flight nurses, and expanded to such an extent that it was necessary to establish temporary branches around the country. At the war's end, the institution had graduated more than 4,200 medical officers and several thousand nurses and aeromedical technicians.[10]

Because of rapid demobilization and loss of public interest, the school had a brief spell of difficulty, but the development of jet aircraft and the advent of rocket missiles soon posed new medical problems for the flyer, and these in turn created a need for continuing research.

In 1946, General Armstrong, then commandant of the school and later Air Force Surgeon General, presented a comprehensive report detailing the need for expanded, modernized facilities for the school, and voicing the need for an aeromedical center, to be designed and built for the special needs of aeromedical research and education in the coming era of rocket flight. It would absorb the School of Aviation Medicine, and expand its facilities for the study and treatment of conditions peculiar to flyers.[2,8,11]

A new, controversial area of aeromedical endeavor, inaugurated in 1948, emphasized the need for a facility like the one proposed by

General Armstrong. At a panel meeting of well-known scientists called by General Armstrong to discuss aeromedical problems of space flight, the school's Dr. Hubertus Strughold and Dr. Heinz Haber set forth their findings on problems which would be encountered in space.[12] This meeting was followed in February 1949



From the fully equipped motion picture-television sound stage in the research shops building at the School of Aviation Medicine, clinical procedures can be transmitted via closed circuit television to classrooms in the academic building.

by the establishment in the school of the department of space medicine, the first of its kind. General Armstrong headed this new department briefly, then placed Dr. Strughold in charge.

In a paper entitled "Where Does Space Begin?" [13] written in 1951, Doctors Strughold, Haber, Konrad Buettner, and Fritz

Haber, the 4 original members of the department, described levels where spacelike conditions are found in the upper reaches of our atmosphere and discussed problems of supplying future spacemen with oxygen and a reasonably comfortable cabin climate. They outlined the need for protecting space crews against cosmic radiation and meteors, and brought up the question of weightlessness in space. This was the first time that such subjects had been comprehensively discussed, and the paper attracted immediate, worldwide attention.

While space research at the School of Aviation Medicine was getting underway, General Armstrong's plans for an aeromedical center were also moving ahead. By the summer of 1949, the project had progressed to the point of approval by the late Secretary of Defense James Forrestal. General Armstrong was named surgeon general of the Air Force, but before departing for Washington appointed an aeromedical planning board to make definitive plans for the center and guide it toward final approval.

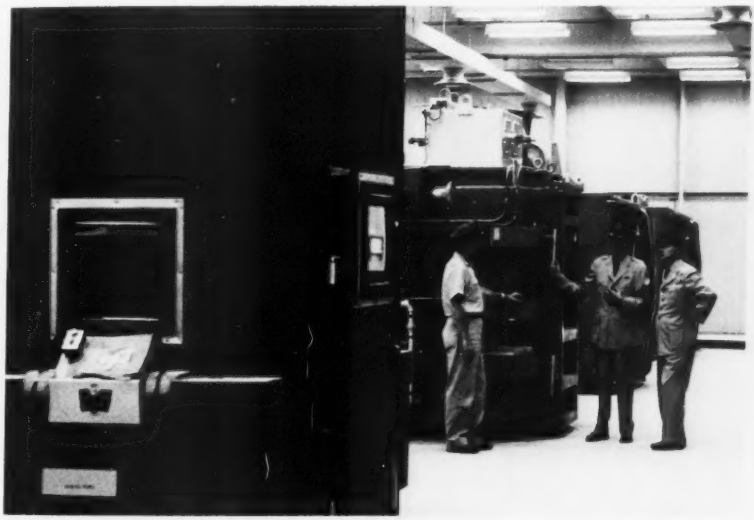
I was named to succeed General Armstrong at the School. As chairman of the Aeromedical Planning Board, I continued General Armstrong's drive toward realization of an aeromedical center. The findings and recommendations of our group were published in 1949 as the "Report of the Aeromedical Planning Board on an Aeromedical Center," [14] and were used as the basis for the original design of the new School of Aviation Medicine at Brooks Air Force Base.

The need for expanded, modernized and centralized facilities for the school became pronounced in early 1950. The outbreak of the Korean conflict brought an immediate increase in the aviation medicine program. The school, long cramped for space at Randolph (it occupied some 44 elderly buildings scattered throughout the base), could expand no further. It was forced to split its operation and set up a branch at Gunter Air Force Base, Alabama. The flight nurse course, together with those for physiologic training of officers and all courses for enlisted men, were transferred to Gunter. The division was not intended to be permanent. Aeromedical center planners intended to reunite the two facilities when the center was realized.

By 1951, detailed plans and specifications for the aeromedical center were completed, calling for 5 main buildings, together with housing and support services. The estimated cost was 30 million dollars, at 1951 price levels. After review by the Air Staff, the plans were divided

into 3 increments, and it was decided to request authority for building the first 2 increments but to ask for funds for the first "package" only. The Bureau of the Budget deleted authorization for the second increment, and slashed the funds for the first from about 10 million dollars to 8 million dollars. The latter figure was authorized by Congress in July 1952.

On the heels of the drastic reduction in the proposed facilities came an addition to the function of the school. In October 1952, the institution assumed responsibility for the specialized practice of



Low pressure chambers in the altitude laboratory, the last building to be completed at Brooks, are used in indoctrinating students in the physiologic stresses of flight and the uses of oxygen equipment and pressure suits.

aviation medicine. Under this arrangement, special consultation services would be offered for difficult or borderline diagnostic problems encountered by flight surgeons in the field. This service quickly developed to the point where specialists from the school were examining an average of 400 referred patients each year. It was recently organized into a directorate of consultation services, headed by Dr. Lawrence E. Lamb.

The American Board of Preventive Medicine received authorization from the American Medical Association in February 1953, to estab-

lish aviation medicine as a distinct specialty and to grant specialty certification to physicians properly qualified in aviation medicine, culminating 10 years of planning and hard work by aeromedical leaders. Prominent in the campaign were General Armstrong, Dr. Bauer, Captain Wilbur Kellum, MC, USN, now retired, Dr. Jan H. Tillisch, of the Mayo Clinic and medical director of Northwest Airlines, Dr. Conrad Berens, pioneer flight surgeon and distinguished ophthalmologist, Dr. Walter L. Bierring, chairman, and Dr. Ernest L. Stebbins, then secretary-treasurer of the American Board of Preventive Medicine, and I. It was my honor to be named the first vice chairman for aviation medicine of the American Board of Preventive medicine. It was the first time a branch of medical science, starting as a strictly military endeavor, attained formal status as a medical specialty.[15, 16]

Another milestone was reached in May 1957, when ground was broken for the new School of Aviation Medicine at Brooks Air Force Base. Among the participants was Representative Paul J. Kilday, of San Antonio, a zealous supporter of the school in Congress since plans for the new center were first drawn up.

On August 3, 1959, I officially transferred the school's command post to the new facility at Brooks and at the same time opened the academic building. The first class to attend the primary course in aviation medicine at the new school began work on August 11.

At the new quarters, the school has a total of 47 buildings with 460,000 square feet of floor area. Principal activities are conducted in 5 new, permanent structures on a knoll on the northwest corner of the base. The first increment of the 3 planned, the buildings have 280,000 square feet of floor area. Concentrated on 15 acres of ground, they include the research institute, altitude laboratory, academic building, flight medicine laboratory, research shops building, and heating-cooling plants.

Although the new establishment is an improvement over the Randolph facilities, it is far from adequate. Many of the school's functions are housed in 36 old, wooden buildings, scattered throughout the main part of Brooks more than a mile from the new complex. Because of the lack of space and special equipment in the old buildings, a wide variety of medical research laboratories have been crowded into the new structures on the knoll.

The 4-story research institute, for example, is fairly bursting with people, laboratories, and equipment. It houses part of the space medicine division laboratory, including the one- and two-man space cabin simulators, supply services, part of the audiology laboratory, the offices of the school commandant and his staff, the "hot wing," housing the school's high-level cobalt-60 radiation facility and an area for the study of potentially infectious agents, the aeromedical library of 47,000 volumes and part of the department of microbiology-cellular biology, laboratories for pathology, toxicology, and pharmacology, part of the space medicine division, and the department of veterinary services.

The greatest improvement offered by the new school is its academic building, with 16 modern, fully equipped classrooms seating 735 students, an assembly hall seating another 433, and a 2-story aviation medicine examination wing. The assembly hall and some of the classrooms are equipped with closed circuit TV, which will enable students to observe clinical procedures without leaving their seats.

A major step toward final realization of an aeromedical center built around the School of Aviation Medicine was made in January 1959, when we proposed that the school be combined with the 1000-bed U.S. Air Force Hospital at Lackland Air Force Base. Such a move, we believed, would develop facilities equivalent to the research and academic portions of the aeromedical center as originally planned. We further proposed that the official name of the combined facility be the "Aerospace Medical Center."

Early in October, both proposals were officially adopted. The Aerospace Medical Center was created, including the School of Aviation Medicine, its Gunter Branch, the U.S. Air Force Hospital and the epidemiologic laboratory at Lackland. The new center was assigned to Air Training Command, which has its headquarters at Randolph Air Force Base.

With the formal dedication this month of the new School of Aviation Medicine, aeromedical science in the United States will have achieved a tremendously important goal. With the facilities of the Lackland hospital and the epidemiologic laboratory, and with the 7 additional new buildings we must have at Brooks, America will have an aeromedical research and education center, together with [illegible] modern diagnostic and patient treatment facility, second to none in the world.

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HARNESSING THE WILL POWER

While accepting a variety of influences on the desire to eat, the fact remains that food-taking is a motor act of skeletal muscles—voluntary muscles which are under the control of the will. Harnessing will power remains the point of break-through in dietary therapy.—LEMUEL C. MCGEE: Man and His Food Intake. *Delaware State Medical Journal*, July 1959.

Space Begins at 50,000 Feet

COLONEL VINCENT M. DOWNEY, USAF, MC

I PROPOSE to discuss the anatomy of the stratosphere in the area of 50,000 to 100,000 feet, in order to define the aeromedical problems that face us today in flights at that height. First of all, in any discussion of high-altitude flying we must define our terms. How high is high altitude? Again, since we hear a great deal of talk today about space flight, what is a space flight? Where does the atmosphere end and space begin?

From the standpoint of the geophysicist, Earth's atmosphere extends at least 1,000 km, or 600 miles. Therefore, all of the so-called space flights (with the exception of some satellites) have actually been flights within the Earth's atmosphere. We are air-breathing creatures, ideally suited for life at the bottom of an ocean of atmosphere. Our past achievements in atmosphere flight, in fact, have been modest indeed. We have jumped a few inches off the bottom—25 miles at the most—in an atmosphere that measures at least 600 miles.

If we attempt to fly in the stratosphere, we must bring along our own atmosphere, from which we derive oxygen, the essence of life itself. We need a certain barometric pressure on the surfaces of our bodies to keep body water in solution. We will be like fish out of water when we attempt to fly above 63,000 feet; when scientists bring to the surface fish that are adjusted to the tremendous pressures at the bottom of the ocean, the fish literally burst from vaporization of their body fluids.

The more we contemplate space flights, the more we realize that the earth itself is an ideal space vehicle, truly traveling in space in its planetary course around the sun. In order to escape from our own Earth, we must bring with us at least the essential components of our atmosphere.

The atmosphere is defined as a gaseous envelope surrounding the

From Office of the Surgeon, U.S. Air Forces in Europe. Presented on 19 May 1959 at the annual USAFE Aeromedical Symposium, Wiesbaden, Germany. Col. Downey is now surgeon, Ninth Air Force, Shaw Air Force Base, South Carolina.

solid earth. It is composed principally of nitrogen—79 percent—and oxygen—20.9 percent; the remainder is carbon dioxide and certain rare gases. The proportions of these gases remain relatively constant, at least up to 100,000 feet. Air behaves like any gas mixture. It has a definite weight, which we call barometric pressure—14.7 lb per square inch at sea level, or 760 mm Hg.

The most important human consideration is that the density of air decreases rapidly. Being a gas, it is more dense in the lower reaches of the atmosphere, and barometric pressure decreases rapidly as we ascend from sea level. At 50,000 feet the barometric pressure is 87 mm Hg or 1.69 lb per square inch; at 100,000 feet the

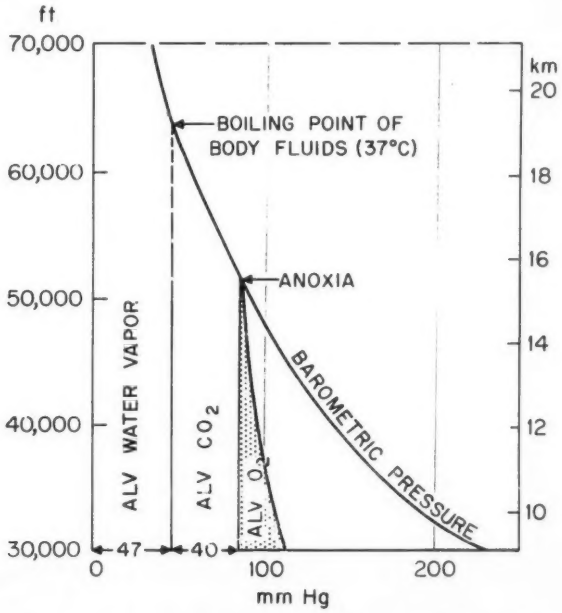

Figure 1. Relationship of alveolar oxygen, carbon dioxide, and water vapor to barometric pressure. Alveolar oxygen pressure represents only a small portion of the total barometric pressure. Alveolar gases are fully saturated with water vapor, which takes up a partial pressure of 47 mm Hg. A further partial pressure of 40 mm Hg represents the alveolar carbon dioxide tension. The alveolar oxygen tension is shown in the dotted area. It decreases to zero at approximately 50,000 feet. (After Strughold [1, 2])

barometric pressure is only 8 mm Hg or 0.15 lb per square inch. A barometric pressure of 8 mm is actually a high vacuum. In other words, practically all of the mass of the atmosphere is below 100,000 feet.

From the physiologic standpoint a barometric pressure of 87 mm Hg is critical (fig. 1). Such a pressure—87 mm Hg—is equivalent to an altitude of 50,000 feet, or approximately 15 km above the surface of the earth. Hubertus Strughold [1, 2] has made the statement that 15 km or 50,000 feet is the anoxia level of the atmosphere. In other words, at 50,000 feet we reach the physiologic zero point in oxygen availability, even though oxygen is still found in the atmosphere.

This total anoxia results from two factors. First, the gases contained within the lungs are fully saturated with water vapor. Water vapor exerts a barometric pressure of 47 mm Hg at body temperature. In other words, this 47 mm must be subtracted from the 87 mm of barometric pressure available to supply oxygen to the lungs. Secondly, carbon dioxide is also present in the lungs, with a partial pressure of approximately 40 mm Hg. Carbon dioxide originates from within the body itself, so that it is impossible to prevent its diffusion into the alveoli. We must subtract another 40 mm from our 87 mm Hg for carbon dioxide and we find that the two figures, 47 and 40, exactly equal 87 mm Hg—the barometric pressure at 15 km or 50,000 feet. In other words, above this point we cannot receive any oxygen into the lungs, because they are already filled with water vapor and carbon dioxide.

Strughold calls this a space-equivalent condition. Above 50,000 feet we are in space (physiologically speaking) from the standpoint of oxygen availability from the atmosphere. It is true that we can depress the carbon dioxide content by altitude acclimatization, but this will raise the anoxic level to perhaps 55,000 feet at the most.

A second space-equivalent level is a little higher (19 km or 63,000 feet) at a barometric pressure of 47 mm Hg. The water vapor pressure in the lungs is 47 mm. In other words, water vaporizes or "boils" at 37° C, at a barometric pressure of 47 mm Hg. Water boils when the vapor pressure of the fluid exceeds the barometric pressure above the surface of the liquid. At sea level this phenomenon occurs when water is heated to 100° C. But water also boils at much lower temperatures, when the gas pressure above the liquid is decreased below the vapor pressure. At a temperature of 37° C, water boils at a barometric pressure of 47 mm Hg, equivalent to an altitude of 63,000 feet or 19 kilometers—11 miles above sea level. Above this point we are in space, from the standpoint of the supportive pressure

of the atmosphere upon the surface of our bodies. We need this ambient pressure to keep body water in a liquid state.

The rapid evaporation of body fluids was pointed out by Armstrong [3] as early as 1935. In 1936,[3] he demonstrated the appearance of gas bubbles in the mucous membranes of surface organs, such as the mouth and conjunctiva, when he exposed rabbits to a simulated altitude of 63,000 feet. By passing the blood from the carotid artery through a glass window he found that fluid blood became totally vaporized at 63,000 feet altitude. This is the second space-equivalent level of the stratosphere—at a barometric pressure of 47 mm Hg and altitude of 63,000 feet—the Armstrong line.

According to Strughold, these two levels are formidable enough to justify the statement that an aircrewman flying above 63,000 feet must be considered to be in space, since the physiologic effects upon his body are the same as those in the vacuum of space. Without assistance he is unable to breathe any oxygen from the atmosphere; his body water will not remain in solution above the Armstrong line of 63,000 feet.

I am amused by the oft-repeated question, "When is man going on a space flight?" The truth is that he has already flown in space, or rather under space-equivalent conditions. Captain Kincheloe flew to an altitude of 126,000 feet. Dr. Dave Simons [4] made a balloon ascent to over 100,000 feet for a prolonged period. The first truly space-equivalent flight was made by Anderson and Stevens, who on November 11, 1935 ascended in a balloon to 72,395 feet.[5]

Most of our aircraft today use pressurized cabins. The cabin atmosphere is maintained higher than the ambient altitude of flight by means of a pump, which compresses the outside air and increases the cabin pressure. Most combat aircraft have a pressure differential of roughly 5 lb per square inch above the actual altitude of the flight.

This principle of cabin pressurization must be discarded at approximately 80,000 feet. The air density at about 24 km or 80,000 feet is only 0.04 percent of that of sea level. At or above 80,000 feet it is technically impossible to acclimatize a cabin with compressor pumps. Consequently we must resort to a sealed cabin in which the atmosphere is artificially produced inside the cabin.

Sealed cabins are not new. All of the "astronauts" have used sealed cabins. Anderson and Stevens used a liquid oxygen-nitrogen mixture to maintain pressure in the gondola.[5]

Jet engines themselves are plagued by the same limitations as man, with respect to oxygen. Jets derive their oxygen from the atmosphere for the combustion of the fuel. This limits the altitude capability of jet engines flights to the stratosphere well below 100,000 feet. To fly

higher we must use rocket engines, which carry along oxygen for fuel combustion.

In the altitudes we are discussing—50,000 feet to 100,000 feet—aircrews are using jet aircraft with pressurized cabins. It is a transition zone. The flights are not truly space flights, but neither are they truly atmospheric flights. This is what presents our dilemma. When we get combat aircraft with rocket engines and sealed cabins we will have the green light to space; we will be resigned to all the problems of space flight. But it is only human nature to temporize and cling to the things of the past. We know that simple pressure breathing masks have sufficed up to 43,000 feet. Why won't they work above 50,000 feet? Why resort to the cumbersome pressure suit which the flight surgeons advise wearing above 45,000 feet? Why can't the flyer have shirt-sleeve flying, in which he sits unencumbered in a comfortable capsule, smoking a cigar, and adjusting the controls from time to time, or just checking on the already programmed flight profile which is automatically fed into the controls?

We would like to have these things, but they are things of the future, not the present. As soon as we have an aircraft cabin which is as dependable as the wing, we may discard pressure suits. We may discard oxygen masks too, if engineers can produce a cabin atmosphere of 10 lb per square inch.

However, until the happy day when engineering achievements have insured an absolutely safe cabin, we must provide for cabin failure. We must recognize the fact that today's flights above 50,000 feet are space equivalent, from the standpoint of absolute anoxia. Space begins at 50,000 feet.

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Decompression Sickness: The State of the Art

MAJOR JOHN R. PFROMMER, USAF, MC

DECOMPRESSION SICKNESS, a disease of many names and many manifestations, has been known and observed for over a century. It has long been a recognized problem in diving and in submarine medicine; and with the engineering advances which facilitated rapid ascent by aircraft to altitudes over 30,000 feet, it became a concern of the flight surgeon.[1-6] We have often spoken as familiarly of decompression sickness as if its many mysteries were quite transparent, and yet as ignorantly as if we had never known of the disease.

Much research in decompression sickness has been stimulated by the observations of those associated with divers. Kratochvil [7] emphasized the contributions of Alphonse Jaminet, physician to workers building the Illinois-St. Louis bridge over the Mississippi in 1870, who wrote the first American monograph in this field. A multitude of physiologists and other medical men have followed (as some had preceded) with observations, and with suggestions for nomenclature and causation of this mysterious affliction.

Hornberger [8] pointed out that decompression sickness was not a great problem in practical flying until the end of World War II. Since that time, more flying at increasingly higher altitudes has accentuated the problem in aviation, both in aircraft and in low-pressure altitude chambers.

Differing ideas concerning the cause of the various symptoms associated with effects of environmental pressure changes on the human organism have understandably produced a variety of names for the conditions observed. The fact that the multitude of symptoms resulting from decompression do not always appear together, or in sequence or predictable combination, has not aided in producing logical nomenclature. Such terms as "aviator's bends," "high altitude

From Office of the Surgeon, U.S. Air Forces in Europe. Presented on 19 May 1959 at the annual USAFE Aeromedical Symposium, Wiesbaden, Germany. Maj. Pfrommer is now at 7112th Central Medical Group, APO 332, New York, N.Y.

diver's disease," "aeropathy," and "chokes" are but a few. Armstrong [9] originally suggested the word "aeroembolism," and although this term was widely used, especially in America, he later found it to be too restrictive in its meaning. Berry [10, 11] today prefers the term "dysbarism." The term "decompression sickness" (Druckfall Krankheit) was introduced in the German literature in a report by Hornberger in 1941 [8] and has since been widely accepted. The German term "Druckfall Krankheit" is not exactly identical with the American term, in that it does not include the gas pains often seen early in decompression sickness; these may result from mechanical distention of bowel without evolution of gas.

SYMPTOMS, SIGNS, AND DIAGNOSIS

The recognized and recorded symptoms of decompression sickness are legion. They range from marked fatigue after a stay at altitude to complete collapse and death. Behnke [12] has written an excellent review of the symptomatology and pathology of the disease, and Adler's [13] comprehensive list of symptoms involves almost every organ system. Downey [14] feels that abdominal pain is almost always the earliest complaint. Scotomas, headache, dizziness, itching, and other paresthesias of the skin are often present. Mottling of the skin is associated with extensive involvement and a poor prognosis. The phenomenon named "bends" by divers is a frequently recognized symptom. The pain of "bends" is usually thought to involve the joints [9, 15] but Hornberger [8] states that the pain is localized mainly in the bone endings near the joints rather than in the joints themselves. "Chokes," an oppressive sensation in the chest with dyspnea and cough, is often associated with "bends."

Lesions of the spinal cord due to rapid decompression are well known in divers and caisson workers, but seem to be rare in airmen. Höök [16] followed one case with spinal symptoms and comparatively slight shock, whose paraplegia gradually diminished over a period of months. This pilot is flying again, after 2 years, although some neurologic signs of his ordeal remain.

Neurocirculatory collapse with unconsciousness is perhaps the gravest manifestation and is often a consequence of neglect of earlier signs and symptoms. Adler [13] felt the incidence of this was small, with 150 cases in approximately one million decompression chamber tests. There were seven deaths in this series. At different times Masland,[17] Adler,[13] and Berry [11] have attempted to classify forms of collapse at altitude or in chamber reactions. Bratt [18] reported a case of collapse and unconsciousness, with associated mediastinal emphysema, following rapid decompression. Holmstrom [19] recorded several cases

of collapse during rapid decompression, but feels that the collapse is not related to decompression sickness; rather it is caused by the mechanical effects of rapid expansion of trapped gases in the lungs. His opinion is substantiated by Hornberger's [8] observation that "there is no acute decompression sickness." The chief symptoms Holmstrom [19] lists are abdominal or thoracic pain, irregular respiration, pallor and sweating, loss of consciousness, and transitory neurologic findings. Physiologists 80 years ago observed most of the symptoms of decompression sickness. It has been said that the symptomatology had been described almost completely by 1941. And yet today there is far from complete agreement concerning the evidences of the disease.

CRITICAL ALTITUDE

What are the pressure differences necessary to produce decompression sickness? Since there is no agreement as to just what constitutes the disease, we may naturally expect a variety of opinions regarding altitudes necessary to effect it. Hornberger,[8] in sketchily summarizing the German studies during World War II, first stated that 36,200 feet is the lower limit for development of decompression symptoms, but later noted that an empiric figure of 23,000 to 26,200 feet may be given for this same lower limit. Schneck [20] noted that while central nervous system involvement is unusual below 30,000 feet, other manifestations have long been known to occur below this altitude. Today, Berry and King [21] state that this complex of symptoms may have severe manifestations at altitudes as low as 22,000 feet, and White's [22] opinion is essentially the same. Odlund [23] recently reported fatal decompression sickness at an altitude of 22,000 feet. We may anticipate with certainty a further lowering of the critical altitude as our understanding of decompression sickness increases.

CAUSATION

The consensus is now that the symptoms of so-called decompression sickness are caused mainly by the evolution of gaseous nitrogen from the blood and tissues. But there is no general agreement as to whether this nitrogen represents autochthonous (locally evolved) gas, whether it is in combination with other gases of the body, and whether other than physical factors are instrumental in its evolution. In arriving at our modern concept, and its variants, we have seen many interesting opinions of causation and contributing factors. Most of these probably do not differ greatly from the ideas of Robert Boyle,[24] who in 1670, after subjecting animals to the effects of partial vacuum by using the newly developed air pump, wrote, "The little

bubbles . . . by choking up some passages, vitiating the figures of others, disturb or hinder the due circulation of the blood." Few today feel that we are making a mistake, *post hoc*, in ascribing symptoms to the observable gas. It is not yet clear whether chemical and metabolic processes effect the formation of the gas bubbles.[8]

Ninety years ago, Jaminet [7] believed that the syndrome resulting from too rapid decompression was caused by temperature change, alteration of blood and spinal fluid pressure, time of decompression, and an elongated stay under increased pressure.

In 1942, Behnke [25] suggested that the narcotic effect of nitrogen was partly responsible for producing unconsciousness in caisson disease. This has not been important in decompression sickness associated with flying, for this is an effect of compression rather than of decompression.[10]

Schneck [20] feels that the multiplicity of generalized symptoms suggest scattered intracranial lesions, presumably the result of gas bubbles, fat emboli, or vasospasm. Haymaker, Johnston and Downey [26] also suggest that fat emboli as well as gaseous phenomena may contribute to the etiology of decompression sickness. At present there is disagreement about the significance of fat emboli, which may be found at postmortem without previous history of trauma to the deceased. Haymaker and Johnston [27] point out the possible role a patent foramen ovale might play in the transport of emboli from the venous to the arterial circulation, although they emphasize that this might also be accomplished via arteriovenous shunts. Adler,[13] Halbouty and Long,[28] and Berry [11] all imply that collapse may be due to trauma to the autonomic nervous system. A pulmonary-coronary reflex has been postulated as a possible cause of the oppressive sensation felt in the chest in "chokes." [8]

If there has been general agreement about the basic etiology of decompression sickness, a multitude of contributing or precipitating factors have also been suggested. Hornberger [8] and others point out that severe pain associated with abdominal gas or bends may produce collapse at altitude, and that the psychic effects of pain and of the frightening and ominous environment often associated with the disease may predispose to collapse. The amount of work performed at altitude, the environmental temperature, and the duration of exposure seem significant. Obesity has been noted in a large percentage of subjects suffering fatal decompression sickness, and the fat-nitrogen-helium interrelationship is a large subject in itself. We know that bone marrow is about 90 percent fat [25] and it is very tempting to associate this fact with the bone pain noted. Age is a factor, for more efficient tissue tonus and elastic tissue forces may give the

younger person an advantage. Berry and King [21] state that lack of sleep during the previous night, or the recent ingestion of fatty food or alcohol may predispose to symptoms. Rosenbaum [29] recognized no correlation between hypoxia and bends, and although many might disagree, few would be willing to test this hypothesis at significant altitudes.

Today we may say that the symptoms of decompression sickness result from the evolution of gaseous nitrogen, and possibly of other body gases, during environmental atmospheric pressure changes. The symptoms are the effects of the gases' influence, in some incompletely understood manner, on adjacent or distance vascular and somatic tissue. It is speculative to say more than this.

Johnston [30] and others have tried to substantiate the diagnosis of decompression sickness by performing autopsies with the victim submerged in water, in an attempt to demonstrate the presence of gas in tissues. These efforts have met with indifferent success.

TREATMENT

In the past, treatment of decompression sickness has been almost entirely empiric. Oxygen, vasopressor drugs, and intravenous fluids have been most popular in combating collapse and unconsciousness. Halbouty and Heisler [31] favor the use of lumbar puncture and emphasize that tracheotomy may also be available.

Downey,[14] Behnke [12] and others have advocated recompression to pressures as high as 3 to 5 atmospheres for those with symptoms of decompression sickness. This treatment has not been properly evaluated as yet. It may prove more valuable to those suffering symptoms in an altitude chamber equipped for recompression to one atmosphere or more than to those afflicted in the air, far from a recompression chamber.

The operation of a low pressure chamber must include the maintenance of a medical operating area for managing altitude chamber reactions. It should include a bed and materials for diagnostic and therapeutic procedures. Patients with milder involvement, in which symptoms disappear on return to ground level, may be observed here before discharge to duty, while patients with persistent "bends" or in collapse may be given emergency supportive treatment before being transported to the hospital.

COMMENT

If we accept the dictum that "space begins at 50,000 feet," our pilots at the present time are traversing the boundaries of space. A con-

sideration of the problems involved must be implicit in our studies of decompression sickness. We must attempt to resolve our doubts on such matters as the equation of symptoms with the evolution of gas and consequent bubble formation, and strive to find the true nature of the malady.

The increasing number of ventures into space for long periods of time raises many questions: What will be the physiologic consequences of long-term exposure to decreased atmospheric pressure, in an orbiting satellite? What really are the lower limits of altitude that may produce decompression sickness? What will be the nature of the atmosphere the space man will combat? How much nitrogen will it contain? What type of pressure suit will the space man wear? These are only a few of the questions that will have to be answered. They are significant questions even now.

SUMMARY

Literature regarding investigation and case reporting of decompression sickness is reviewed. Present knowledge concerning etiology of symptoms of this affliction is incomplete, although it is generally agreed that body nitrogen evolved during atmospheric pressure changes plays an important part. It is emphasized that a consideration of the problems involved in space flight is implicit in further investigation of decompression sickness.

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Break Off: A Phase of Spatial Disorientation

LIEUTENANT COLONEL MARTIN B. GIFFEN, USAF, MC

AVIATION is a relatively young science as measured in time. By its progress, however, it appears to stride above the earth as a colossus. As we put more pilots into the air, flying more hours and traveling farther away from the earth's surface, we are likely to overhear them discuss new and peculiar sensations and experiences. So far, we have not reached that stage in our knowledge where we can complain because there are no more syndromes to describe, symptoms to classify, or problems to solve. Recently the new term "break off" has appeared in the literature. This has been defined as "the feeling of physical separation from the earth when piloting an aircraft at high altitude."[1] With this definition, the group of symptoms to be discussed can belong only to aviation. Yet, when unusual attitudes, symptoms, or sensations occur under unusual circumstances in a very select group, we should begin collecting information to discover whether these circumstances are unique or whether antecedent experiences have been recorded and noted, to determine the origin, effects, and direction of these symptom clusters.

A study was undertaken to determine the significance[1] of the term break off as it gained in prominence and came to the attention of aviation medicine officers. Of 137 pilots interviewed and questioned concerning this phenomenon, 37 percent reported experiencing the break-off effect, described as a feeling of being isolated or detached, sometimes accompanied by a sense of exhilaration. Of those experiencing the break-off effect, 38 percent noted anxiety and fear, 71 percent reported loneliness, and 90 percent stated that break off occurred when flying alone at high altitudes. Another significant point was that break off occurred more frequently when the pilot had "time on his hands." These sensations took place only in jet aircraft and the experience level of the individual pilot did not appear to be a factor in causing the break-off effect. Similar observations have been made by scientists of other air forces. Bennett[2] examined pilots who experienced this effect and who reported feelings of confusion, apprehension, and false sensations in solo flight above 20,000 feet. Onset

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of the symptoms occurred at least an hour after the aircraft was aloft. All pilots felt isolated and as if in an unrealistic and dream-like state. A Netherlands Air Force pilot [3] reported severe symptoms experienced while piloting a conventional aircraft in cloud layers where points of reference were nil, the air was smooth, and there was only minimal sensory stimulation.

As one seeks precipitating factors that could produce the foregoing symptoms, it would appear that the most important element is that of isolation. Isolation must be considered as a subjective as well as an objective state. By subjective state is meant a state of realization or appreciation of being detached from or cut off from the familiar. The objective aspects should consider the normal sensory stimuli that impinge upon the body and that need interpretation, evaluation, and action. Reduction of these, too, would isolate the individual. As we consider both these aspects of isolation, either phase would be—and apparently has been—capable of producing a gamut of symptoms ranging from very mild transitory ones to markedly severe and disorganizing changes. The term break off, although not scientific, is interesting and descriptive, implying an end, almost a feeling of no return into an unknown and somewhat frightening void.

Although for many years individuals have recorded their experiences with isolation and its effects, little attention was paid to them until larger segments of the population were subjected to a voluntary and directed isolation. Explorers and other scientists have isolated themselves and have written about their experiences and the dramatic psychic effects they noted during their course, such as Byrd's account [4] of his isolation in the arctic region and Bombard's [5] of his trip across the ocean on a raft. During and after the Korean conflict, great concern arose over the changes that could be produced within the prisoners-of-war. This stimulated much research on the effects of isolation upon the individual and the group. Numerous experiments had been carried out in an attempt to understand, evaluate, and predict what occurs in periods of isolation. In one such research project [6] the number of sensory input stimuli was reduced by submerging subjects in a constant temperature water bath, permitting them to breath only by means of underwater equipment. About 45 minutes after submergence a review of the day's events preceding the immersion appeared. This was followed for the most part by a tranquilizing effect as the subject relaxed and was similar to that noted when disturbed patients are placed in hydrotherapy tubs. Then extremely dramatic changes occurred, described as a subjective tension progressing to eruption of

highly charged personal material that was quite unpleasant and distasteful to the individual. If the individual remained submerged in the water bath up to 3 hours, there were hallucinatory experiences. Another experimental effort consisted in having subjects lie on a bed with frosted glasses [7] covering their eyes. After several hours, directed and organized thinking became progressively more difficult, suggestibility was greatly increased, and the need for extrinsic sensory stimuli and body motion became more acute. Most subjects found they could not tolerate the experiment for more than 72 hours. Those who remained longer than 72 hours usually developed overt hallucinatory experiences and delusions, similar to those reported from mescaline and lysergic acid diethylamide (LSD).

In research on experimentally produced deafness, it was found that there were marked individual differences when cotton plugs dipped in petrolatum were placed in the ears of subjects for a period of 3 days.[7] By and large there was inability to speak with normal volume, decreased motivation for studying, marked irritability, exaggerated response to stimuli, and a desire either to withdraw from situations or to rush precipitately into them. Feelings of personal inadequacy were also expressed. Other types of research have consisted of putting men in isolation chambers [8] furnished with a bed, chair, chemical toilet, and refrigerator for varying periods of time. The results were similar to those from other isolation experiments. One does not necessarily have to establish elaborate experiments, however, to be able to appreciate the existence of emotional changes in individuals who have been subjected to altered environments. It is not uncommon on ophthalmologic services, especially in dealing with older patients who have undergone bilateral cataract operations with both eyes covered, to have the patient become grossly confused, disorganized, and disoriented. On many occasions workers in induction stations have noted varying degrees of depersonalization among new recruits arriving at a strange and untried environment. This has also been observed in men newly arrived at overseas stations, where the subject realizes that he is physically present in the area but does not have complete feeling of having arrived. On pediatric wards the child separated from his mother may experience feelings of anxiety and fear that may culminate in the classic signs of a depression.

To appreciate the effect of a reduction of stimuli, a very simple test would be to walk into a soundproof room such as an audiometer room and sit perfectly still for a few minutes. Where there is an observation window outside the range of the individual seated within, it is not uncommon to notice tension in the subject. It has often been

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observed that as he leaves the room he breathes a sigh of relief.

From birth to death, man is constantly bombarded by numerous stimuli of varying intensities and descriptions. He reacts to these or ignores them, depending on his immediate frame of reference and needs of the moment. He is usually seeking or attempting to create a comfortable and familiar environment. Confronted with unexpected or unusual environmental conditions, he reacts none too graciously and attempts to handle the situation in the best way available to him. It would appear that symptoms arise when his grasp of reality becomes loosened or threatened. If the situation continues so that he can no longer cope with the environment, he struggles to re-establish a familiar pattern, and symptoms develop. Certainly, the production of hallucinatory experiences of a visual or auditory nature would be an effort on the part of the affected individual to project a familiar sight or sound into his environment in an attempt to regain homeostasis.

That portion of the person concerned with the interpretation of external or internal stimuli and of objects and object relationships has been termed the ego. The ego is the portion of man that permits him to test situations, receive stimuli, make choices, ignore, come to decisions, and prescribe necessary actions. When this ability is interfered with, undesirable symptoms and syndromes appear. In order to live and function, man must associate with others in a society and culture that he has developed. Any variation or deviation from this pattern he would consider unnatural and intolerable to life and would attempt to overcome. Therefore, isolation, which is unnatural whether it is subjective, objective, or both, threatens the ego and may call forth a stream of activity. It would seem that reduction in stimuli or loss of the feeling of belonging causes a loosening or dissolving of ego function, becoming manifest as disorganization with reduction in controlled ability to select and interpret and to act in a real and appropriate manner. Because ego has as its windows the special sensory organs, symptoms can and may be projected to any one of these. Thus, in the visual field, position and relation of objects may vary and change. In vestibular function, vertigo may occur. Kinesthetic sensation may become distorted. Auditory symptoms may arise or sounds become distant or distorted. Certainly, personality factors would play an important part in the production of these symptoms as far as the time of their occurrence is concerned. In persons with well-organized ego boundaries and good self concepts, it will in all probability take longer for symptoms to be produced, or the symptoms themselves may be of a milder nature

and not as intense in degree as in those with poorly defined concepts. In a certain percentage of individuals this phenomenon is probably a reaction that we can expect because of the ego and because of the human concern with preventing change and keeping situations in the internal and external environment constant. It may well be that in some ego structures with the ability of narrowing the field of stimuli, the complex called fascination develops. At the other end of the spectrum, with the lack of stimuli for preservation of ego, we have a dissociative state—break off—with symptomatology.

The circumstances we have described that gave rise to the break-off phenomenon were of short duration, so that subjects could at almost any time return to a good reality testing state. Yet, let us for a moment consider the future, when persons may be confined in extremely narrow environments, possibly motionless for long periods of time, physically isolated from familiar sensations. If, as experiments show, this dissociation of ego function occurs during short periods of exposure, what will happen if subjects are required to maintain themselves for weeks or months in total isolation from a friendly and familiar environment? Outer space offers complete isolation, where even the accustomed blue of the sky is absent, the sensation of motion varies, and nothing familiar is present. Perhaps we shall have to incorporate certain stimuli and human companionship into this isolated space to prevent this disorientation. As far as selecting individuals for trips into outer space is concerned, I know of no new or better criteria than those we now have. It would seem that the individual with a healthy personality, and with well-integrated ego function and self concepts would be, as he has always been for aviation, the ideal individual for future space travel.

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Visual Problems Above 50,000 Feet

MAJOR JAMES L. CURTIS, USAF, MC

SPACE MYOPIA is, in my opinion, the most serious visual problem to be overcome in high-altitude flight, for it presents a true physiologic handicap that can drastically reduce the effectiveness of air-to-air search. High-altitude flight at supersonic speeds taxes the pilot's visual capability to the maximum so far as air-to-air search is concerned. Any factor that will reduce this visual capability limits the effectiveness of manned aircraft as a weapon for transcendence in the air.

Space myopia is actually a misnomer; the correct term should be empty field myopia [1] or empty visual field. An empty visual field may be defined as a visual field that contains no detail upon which the eye can focus. The cloudless sky at high altitude fulfills the requirements of this definition. Other examples are total darkness, fog, or a uniformly overcast sky. It was shown by Whiteside,[1] in collaboration with Campbell, that in the presence of an empty visual field, subjects cannot relax accommodation completely. Accommodation remains in a state of constant activity, fluctuating about a level of 0.5 to 2.0 diopters. The person with normal eyesight is thus unable to focus at infinity if infinity contains no detail subject to sharp focus. Under these conditions, unable to focus farther than a point about 1 to 2 meters away, he becomes effectively myopic by this amount.

After demonstrating that empty visual field myopia is a fact and not a fantasy, Whiteside [1] went on to demonstrate its effect upon the minimum visual angle for a distant target. Tests performed on 63 patients showed that a target had to be twice as big to be detected in an empty visual field as in a visual field with detail at infinity. Doubling the minimum visual angle is associated with 0.75 diopters of myopia.

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Let us consider what doubling the minimum visual angle means in effectiveness of direct visual air-to-air search. If a pilot has 20/15 vision he is able to discriminate a visual angle of 45 seconds of arc. An F-80 fuselage will just fill this angle at a distance of 4 miles. At distances greater than this a pilot may see a speck in the sky but will be unable to discriminate its details. If he has the previously mentioned 0.75 diopters of myopia, this maximum recognition distance will be halved to only 2 miles.

Having now introduced the subject of minimum visual angle and the resultant visual deficit brought about by doubling it, let us apply this to a hypothetic case of air-to-air search. We are in a maximum performance aircraft, flying at a speed of 1,800 miles an hour, when an object appears in our peripheral field of vision. It will take approximately 1.4 seconds, during which time our aircraft will have traveled 3,682 feet, before we can actually recognize the object. Once we have recognized the object, if we now want to move the controls of our aircraft, the motor reaction time will be about .400 of a second. In this time the aircraft will have traveled an additional 1,042 feet, for a total distance of 4,724 feet from extrafoveal appearance to control movement on the aircraft. These figures were first published by Strughold [2] in October 1949. I only mention them now to emphasize the problems of air-to-air search at high speed and to help impress on all of us the truly tremendous loss in visual effectiveness that is incurred from empty field myopia.

In considering the problem of glare in high-altitude flight, the type of light, its direction, and the contrast between brightly and poorly illuminated surfaces are all important. At altitudes up to 100,000 feet we have qualitatively the same kind of light we have at ground level, but quantitatively there is a progressive slight increase with increasing altitude. On the surface of the earth on a clear day the illumination from the sun is about 10,000 foot candles; it is about 11,800 foot candles at 10,000 feet and 13,500 foot candles at 100,000 feet. The illumination in space is about 13,600 foot candles. If we start flying above the ozone layers—that is, above 120,000 feet—ultraviolet light in the 200–300 millimicron band will present a hazard as the ozone layers effectively filter out this light. Specifically, the 288–292 millimicron band is the most dangerous to the eye because it is the wave length band that produces the severe keratoconjunctivitis associated with welding.

Because light is scattered by molecules of air, dust particles, and moisture, and because these particles are less dense in the higher altitudes, the distribution of light changes as one ascends. The sky ap-

pears darker and there is less light on the instrument panel and interior of the cabin. Contrasts become extremely large. There may be a ratio of 1 to 60,000 or more between the brightest and the dimmest portion of an exposed area.[3] At an altitude of 40,000 feet and above all cloud formations, the sky is white at the horizon, decreasing in luminosity toward the zenith, at which point it appears as a rather dark blue. Solar illumination being at 30° of arc from the zenith, as altitude varies from 10,000 to 100,000 feet, the sky brightness at the zenith diminishes from about 500 millilamberts to 10 millilamberts.[4] It becomes obvious, therefore, that with the greatest illumination at the horizon and the smallest at the zenith, the contrast between sunlight and shadow areas at high altitudes is greatest in the lower parts of the cockpit, which are in line only with the darker sky near the zenith.

One of the visual complaints in high-altitude flight is that of cockpit haze. As this is not limited to the lower areas of the cockpit, it must be attributed to factors other than that of altered luminance of the instrument panel. The lens shows maximum sensitivity to wave lengths of 360 to 370 millimicrons and the intensity of ultraviolet radiation between 300 and 400 millimicrons at 40,000 feet is about three times that at sea level. Thus, fluorescence in the lens of the eye might be responsible for this visual haze, a possibility investigated by Whiteside.[1] However, when at high altitude the eyes were covered by a filter that cut off 90 percent of this ultraviolet radiation, there was no change in the subjective haze.

The visual system is particularly sensitive to oxygen lack. Even at 4,000 feet, diminution in absolute sensitivity of the dark-adapted eye to a light stimulus has been reported. In pressurized aircraft during high-altitude flight, a relative anoxia corresponding to altitudes of 8,000 to 10,000 feet may exist. A slight degree of anoxia has been shown to affect day vision as well: for example, after looking at a bright cloud floor or presumably even at a bright horizon, the time that a subject requires to recover sufficient retinal sensitivity to see instruments in shadow is increased. In flight, the usual practice is to glance at the inside of the cockpit for less than 5 seconds before returning the gaze to the exterior scene. This is insufficient time for a pilot to recover from the dazzle of a bright cloud floor. In fact, 1 to 2 minutes may be required for the subjective haze to disappear. Whiteside[1] believes that this haze results from slight degrees of anoxia that are otherwise tolerable and that apparently have no effect upon judgment or other higher cerebral functions. This minimal anoxia, however, has the visual effect of increasing the

duration of the positive afterimage of a cloud floor, thereby producing a persistent haze over the visual field at high altitude.

The complaints of glare per se result from several factors: (1) The reversal of normal light distribution in the visual field, the bright sky at high altitude being below instead of above. This difficulty is accentuated by the fact that the eye has some protection against light from above by the bony formation of the face, which is of little value in respect to light from below. (2) The high luminance of the exterior as compared with the luminance of the interior of the cockpit. (3) Possibly the blue color of the sky, for it has been shown by Ivanoff [5] that a blue source produces more dazzle than does red, yellow, or green. (4) The greater sharpness of shadows cast by the sunlight at high altitude. This may increase simultaneous contrast and accentuate what has been shown to be, at most, a slight increase in contrast between sunlit and shadow areas in the upper part of the instrument panel.

SUMMARY AND CONCLUSIONS

Some of the visual problems of high-altitude flight have been discussed. Emphasis has been placed on practical aspects of these problems rather than on laboratory procedures and research technic. Empty field myopia and its significance as a deterrent in air-to-air search is stressed as the gravest visual difficulty to be surmounted.

I would like to see some research performed to test the effectiveness of a lightweight visual shield, the upper 60 percent of which would be a yellow filter for distance use with a lens strength of -0.25 diopters, and the lower 40 percent a clear glass or plastic for close use with a lens strength of $+.25$ diopters, to supplement glasses and to be utilized only at higher altitudes.

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The Gravity-Free State on a Space Platform

HERMANN J. SCHAEFER, PH. D.

IT IS GENERALLY ASSUMED that on a space platform, orbiting about the earth without drag outside the atmosphere, the gravity-free state is realized in the most perfect manner. While this proposition is entirely valid for the time scale and the motions involved in physiologic processes, it is not rigorously correct from a theoretical standpoint. As will be shown below, the gravity-free state in an orbiting vehicle of finite dimensions prevails only in its center of gravity. At any other point the balance of centrifugal force and gravity attraction is not complete. Minute as the difference is, it is by no means of mere academic interest but has drastic consequences as soon as free motions of objects on a time scale of several minutes or more are involved.

That the foregoing statement is true can be seen by simple general reasoning, aside from the rigorous proof to be given in the following discourse. In the true gravity-free state as it would prevail, for example, in and on a vehicle moving without propulsion in intergalactic space far away from any center of gravity attraction, one would expect that Newton's Lex I (*perseverare in statu movendi uniformiter in directum*) would be fulfilled rigorously and the ideal situation would pertain. Indeed, any object given a linear speed relative to and away from such a ship will persist in that state of motion for any length of time or distance. That a similar proposition does not hold for an object thrown off from an earth-circling satellite is obvious. Whatever the direction and initial velocity of the throw may be, the object will always travel on a trajectory, namely, the new orbit determined by the changed parameters. A permanently rectilinear motion could result only if the velocity would be infinitely large.

The foregoing relationships are well known and elementary. The

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following discourse dealing with them does not claim to convey basically new information. Yet it was believed that a need exists to present these relationships in easily comprehensible terms with the aid of concrete examples, since so far they are only implicitly contained in the literature with the initiated reader left to derive them from the differential equations.

THE BALANCE OF FORCES IN A SATELLITE OF FINITE SIZE

Figure 1 describes the basic geometry of the phenomenon under discussion. The satellite vehicle, assumed to orbit in a perfect circle at a height of 500 kilometers above sea level, is depicted as a rectangular cabin. The balance of forces keeping the satellite in orbit is rigorously fulfilled only for its center of gravity P, as will be shown presently. The center P circles about the center of gravity attraction C in the middle of the earth at a distance of $6{,}370+500=6{,}870$ kilometers. If we assume that the vehicle is not tumbling but maintaining its attitude in "absolute" space, as indicated in the left-hand graph of figure 1, it is seen that a point P_o at a distance $\Delta\ r=10$ meters outside the center of gravity P describes a circle of exactly the same radius as P, yet not about the center C, but about a new center C_o located 10 meters away from C. A similar situation exists for a point P_i at a distance $\Delta\ r=10$ meters inside. As the two points P_o and P_i are engaged in exactly the same state of motion as far as linear speed, angular speed, and radius of orbit are concerned, the centrifugal forces are exactly equal. The respective gravitational forces, however, are not, since all three points have different distances from the center of attraction. P_o is by $\Delta\ r=10$ meters farther away from C than is P, and P_i is by the same distance closer. Hence the balance of forces responsible for the gravity-free state is not fulfilled in P_o and P_i. In P_o a radially outward directed gravitational force will be felt, in P_i one radially inward.

To be sure, the differences under discussion are minute. The gravitational force in P is $F=k/r^2$, in P_o it is $F_o=k/(r+\Delta\ r)^2$, and in P_i it is $F_i=k/(r-\Delta\ r)^2$. Since $\Delta\ r/r$ is a very small magnitude, it is practical to factor out r in the bracketed terms: $(r\pm\Delta\ r)^2=r^2(1\pm\Delta\ r/r)^2$. The quadratic term $(\Delta\ r/r)^2$ then is small by higher order and can be neglected in the evaluation. The outward force in P_o is easily seen to be off balance by the factor $2\ \Delta\ r/r$. This corresponds to a force of $2.5\times10^{-6}G$ where G signifies the acceleration of gravity at sea level on the earth. The force P_i is found to be equal to that in P_o, but acting in the opposite direction, that is, toward the center of the earth.

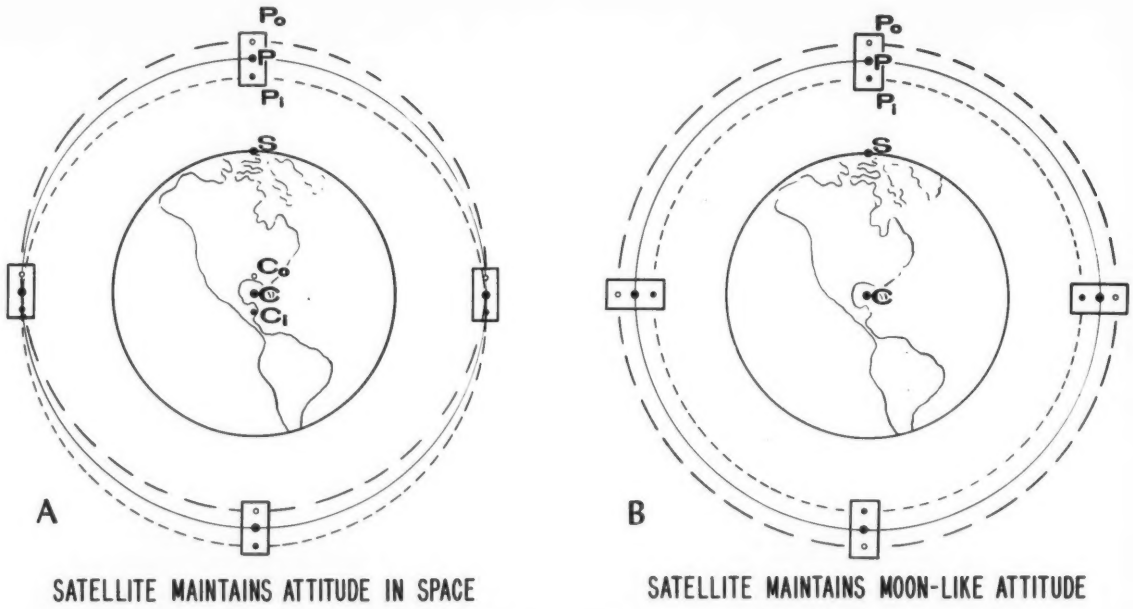

Figure 1. Kinematic analysis of motion for a satellite of finite size at two different attitudes.

P=Center of gravity of satellite. P_o, P_i=Arbitrary points in satellite different from P. C C_o, C_i=Respective centers of rotation for P, P_o, P_i in A. C=Center of rotation for P, P_o, P_i in B.

All distances are greatly distorted. Actual distances are as follows: CS=Radius of earth, r=6,370 km. SP=Height of satellite, h=500 km. $PP_o=PP_i=CC_o=CC_i=\Delta r=10$ m.

Note: In figure A, radii of circular rotation of P, P_o, and P_i are equal, yet distances from center of attraction are different. In B, radii and distances are different.

If the assumption of the vehicle maintaining its attitude is abandoned and a "moonlike" state of motion is introduced in which the satellite always points the same side toward the earth, the disturbance of the balance of forces in P_o and P_i is slightly greater than in the first case. This can be seen from the right-hand graph of figure 1. C is now the common center of rotation for all three points, yet the three radii are different. P_o describes a circle of radius $r+\Delta r$ and P_i one of radius $r-\Delta r$. As a consequence, not only the gravitational force is smaller in P_o but, in addition, the centrifugal force is larger with both increments acting in the same direction. A similar situation exists in P_i. Noting that the squares of the respective velocities of P_o and P_i are $v^2 (r+\Delta r)^2 / r^2$ and $v^2 (r-\Delta r)^2 / r^2$, where v is the orbital velocity of the center of gravity of the satellite, and remembering that the centrifugal force quite generally is equal to the square of the peripheral linear speed divided by the first power of the radius: $F=v^2/r$, one obtains the centrifugal force in P_o as $Fc_o = [v^2(r+\Delta r)^2/r^2]/(r+\Delta r) = (v^2/r^2)(r+\Delta r) = (v^2/r)(1+\Delta r/r)^2$. In P_i the force is equal to the same expression when the plus sign is replaced by minus. It is seen that the term v^2/r in these equations represents the centrifugal force in P and is at the same time equal to the gravitational force in P since for P both forces are equal. According to the square law, the gravitational forces in P_o and P_i are by the factor $r^2/(r+\Delta r)^2$ or $r^2/(r-\Delta r)^2$, respectively smaller or larger than the gravitational force in P. Neglecting again the quadratic terms of $\Delta r/r$ and applying the formula of approximation calculus that $1/(1+\Delta r/r) = 1-\Delta r/r$, one obtains the resulting unbalance factor in P_o and P_i as $3 \Delta r/r$. Expressed in G units, this equals 3.75×10^{-6}G, acting radially outward in P_o and radially inward in P_i.

The question might be asked whether a state of rotatory motion of the satellite can be found at which for any point inside the vehicle the balance of forces is fully preserved. A detailed analysis of this proposition shows that such a full balance of forces in P, P_o and P_i requires respective orbits and speeds which would continually increase the mutual distances of these points from each other.

Again, it should be emphasized that for the functioning of physiologic and sensorial processes the deviation from zero gravity is subliminal by a large margin. Furthermore, this minuteness of the effect is not contingent to the special system of an earth-circling satellite, but derives fundamentally from the smallness of the universal constant of gravitation which equals 6.685×10^{-8} dyne cm^2 /g^2. Due to this smallness, tremendous masses, such as the 5.97×10^{27} grams of the planet earth, are required to produce sizeable gravitational

Note: In figure A, radii of circular rotation of P, P_o, and P_i are equal, yet distances from center of attraction are different. In B, radii and distances are different.

forces. In comparison to such masses, any man-made vehicle will always be negligibly small and so will be the disturbance of the balance of forces in it.

The foregoing analysis is incomplete insofar as it investigates only the state of motion for points on the intersect of the plane of orbit with the satellite vehicle, or, in terms of figure 1, in the plane of drawing. The satellite, however, is a solid object containing also points outside this plane, that is, points above and below the plane of drawing in figure 1. The analysis for these points is more complicated inasmuch as the vector of the gravitational force pointing toward the center of the earth, in this case, no longer lies in the plane of orbit. This leads to a three-dimensional force diagram. Inasmuch as no basically new phenomena other than more intricate paths of motion of free objects are introduced by this proposition, it will not be investigated here.

A further point should be mentioned. The reader is likely to wonder what attitude the orbiting space cabin in figure 1 actually would assume if no artificial means of stabilization, such as flywheel or spinning the entire vehicle, were applied. If the vehicle in the moment of injection into orbit shows no rotatory or tumbling motion whatsoever and maintains its position in "absolute" space (fig. 1A), it will rotate relative to the radius vector connecting the respective centers of gravity of the earth and the vehicle. The sense of this rotation will be counterclockwise if the orbital motion is clockwise and vice versa. It can be shown that in any position during this apparent rotation, in which the long axis of the vehicle does not coincide with the orbital radius vector, a force couple acts on the vehicle which tends to restore coinciding position. The torque of this couple alternates twice during a full orbital revolution between clockwise and counterclockwise direction. As a consequence the vehicle will execute a pendulum type motion about the coinciding position. This motion is called libration.

One might object that under these circumstances the two alternative attitudes discussed in figure 1 are rather unrealistic. With regard to this argument one should consider that a manned vehicle, at least at a more advanced state of satellite technic, is likely to be equipped with artificial stabilizing means to avoid disorientation of the pilot. For the latter purpose, the attitude in figure 1A seems the best choice. The following kinematic analysis therefore is carried out for this case.

KINEMATICS AND DYNAMICS OF CONSORT MOTION

The peculiar situation that a radial gradient of apparent gravitational force, though of extreme smallness, exists in an orbiting satellite, changing from negative values in the earth-near portion of the vehicle to zero in the center of gravity and to positive values in the outer portion, has the consequence that the kinematics and dynamics in and on such a vehicle are profoundly different from those on a ship in a truly gravity-free region far away from any heavenly body. This difference is a very real one and easily recognizable as soon as motions on a time scale of minutes are involved. To the disorientation due to weightlessness, it adds, for a man in such a vehicle, the strange phenomenon of twisting trajectories of floating objects inside and outside the ship into tortuous circular or spiral paths. The following discourse tries to derive two basic types of these trajectories. Though these two cases do not cover all possible curves by far, they represent the two main prototypes and convey an idea of the complexity of the motions involved.

A concrete case will be used to define and explain the basic terms and relationships. We assume that two manned satellite vehicles, 2 kilometers apart, are circling in exactly the same circular orbit of 500 kilometers height. The front man wants to pass a piece of equipment on to his "wing man" 2 kilometers behind. At first sight, one might be inclined to assume that all of the front man has to do is to toss the gear gently "backward" in the direction toward the second ship. Since the gravity-free state prevails for both ships in orbit, the gear, one would think, would slowly cross the distance and arrive at the second ship with the same relative speed with which it had been launched so that it could be easily caught by hand. The subtle error involved in this argumentation is that the object tossed "back" assumes a slightly lower speed than the satellite from which it was launched. As a consequence, its orbital parameters change into those of an ellipse, and it starts "falling" toward the earth. When it finally has changed its relative peripheral position by 2 km, it will be considerably "below" the second ship, that is, closer to the earth.

The correct way to accomplish the task is to toss the object gently "upward," that is, radially outward. It will assume an elliptical orbit swinging out farther radially for a quarter revolution, but will return thereafter and intersect the main orbit. At the same time, its velocity on the outward part of its orbit will be smaller and if the correct launching speed has been chosen, the object will pass through the intersect with the required delay of 2 kilometers.

A still more paradoxical way to achieve the goal is to throw the

object "forward," that is, exactly in the opposite direction of where it is intended to go. Again, it will swing out farther and lose speed after the short initial gain. The new orbit, in this case, intersects the main orbit after a full turn. The transfer, therefore, takes twice the time as compared to the "upward" throw, yet requires less launching speed.

In addition to the two limiting cases just described, any launching angle in the full 90° range between the upward and forward direction is equally suited to accomplish the end if the correct launching speed has been chosen. It will be seen that these launching speeds are surprisingly small yet produce displacements of many kilometers in relative orbital position radially as well as peripherally. Therefore, the small reservoir of muscular force of man represents a most precious and powerful means for the transport of objects of various sizes over the indicated ranges. Near at hand is the idea of designing a spring-loaded launching device to be recharged by man which will lend to this gratis "propellant" the necessary extreme accuracy of aiming and launching speed. As is shown below, this speed would have to be extended down to the range of millimeters per second and below if distances of only a few hundred meters were involved.

We proceed now to a full analysis of the two limiting cases. Since the forward throw is somewhat simpler kinematically, it will be treated first. Figure 2 depicts the geometric situation. The thrown object from now on will be called the consort. It is indicated in the graph by a solid circle. The satellite vehicle from which the consort is thrown (launched) is marked by two circles with connecting bar. For simplicity's sake the terms "up, down, above, below, forward, backward" will be used in reference to the satellite at position zero degrees (position"North" in figure 2). It will be assumed that the consort is launched in a forward direction with a relative speed of 1 meter per second. As soon as the consort has assumed the new slightly larger speed, it will go into a new orbit of slightly greater radius in order to preserve the balance of forces. The centrifugal force is equal to v^2/r. If it is to maintain its value, an increment in v requires a corresponding quadratic increment in r. The consort, therefore, swings out in its new orbit farther away from the center of gravity, thus increasing its potential energy and defraying this increase in turn from its kinetic energy. Its original speed increment $\Delta v = 1 m/sec$ therefore decrease so that finally the speed of the consort before launching, that is, the satellite speed v, is restored. This however, does not restore the balance of forces since the distance of the consort from the center of rotation is now larger than before

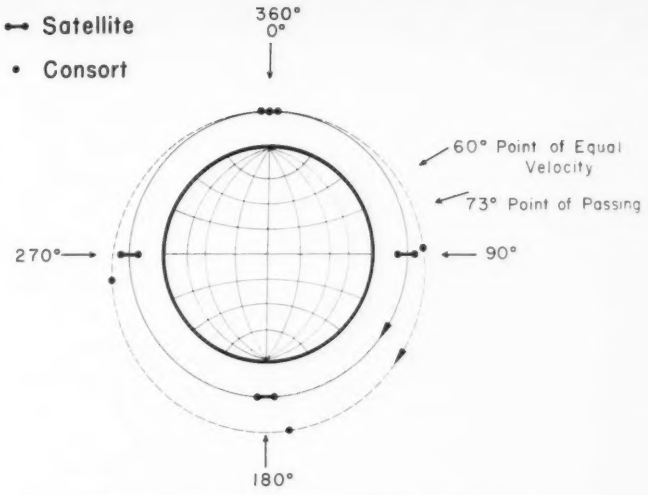

Figure 2. Consort orbit for tangentially "forward" throw.

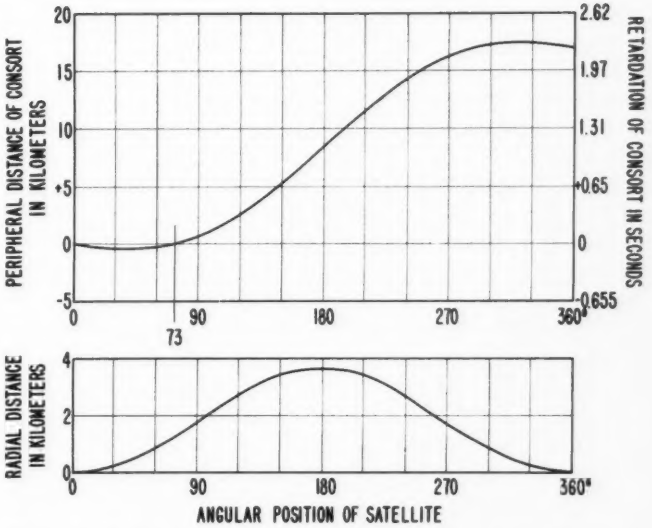

Figure 3. Peripheral and radial distance and time delay of consort thrown forward with 1 m/sec initial relative speed.

launching. As a consequence the consort continues to swing out farther and to lose speed.

Two characteristic phases with regard to consort position and motion relative to the satellite are of special interest. First, there will be a certain angular position of the consort at which its speed becomes equal to that of the satellite. At that position, however, the consort will have traveled a larger angular distance from the launching point than the satellite since its speed, up to that point, has always been larger. As the consort's speed beyond this point of equal velocity continues to decrease, another angular position must soon be reached at which the consort will have lost the entire gain of angular position and is overtaken by the satellite. The mathematical analysis reveals the interesting fact that the angular distances of these two points from the launching point are independent of Δv as long as this latter magnitude remains small as compared to v. This is due to the fact that for a larger Δv, the consort swings out farther and, as a consequence, suffers a correspondingly larger rate of change of velocity which fully balances the higher speed of angular motion. In other words, the point of equal speed and the point of passing have fixed angular positions that do not change whatever initial speed of the consort is chosen. The point of equal speed is reached at 60° and the points of passing at 73° from zero position (launching point).

Figure 3 shows the relationship for a value of $\Delta v = 1$ m/sec. The ordinates in both graphs are directly and linearly proportional to Δv. Therefore, ordinate values for any other consort launching speed may be directly obtained by multiplying the ordinate values of figure 3 by the corresponding fraction or multiple of 1 m/sec.

The particular problem from which the present discussion started specified a peripheral distance of 2 km after 360° of satellite travel. Since $\Delta v = 1$ m/sec produces a distance of 17 km after one revolution, as seen from figure 3, the forward speed required to reduce this value to 2 km is $\frac{2}{17}$ of 1 m/sec, or 11.8 cm/sec. This is a very small initial velocity indeed for throwing an object 2 km back. Of course, it takes a complete revolution and a time span of 94 minutes and 31 seconds to accomplish it.

It is of special interest to describe the consort position during its travel in terms of the satellite as a reference system. If this is done for the nontumbling case of motion as depicted in the left-hand part of figure 1, it simplifies the analysis if a man is visualized standing on the satellite with his head pointing radially outward (upward in figure 1) in the launching moment at 0°. If the man always maintains this position, he will see the consort moving forward in the direction of flight of the satellite immediately after launching. The

exact geometric analysis, the result of which is shown in figure 4, reveals that the radial and the forward component of consort motion exactly cancel the change of angular position of the satellite toward the radius vector of the main orbit. Therefore, the apparent motion of the consort, as seen by the man on the satellite, will be rectilinear and forward at constant speed. In other words, for the satellite as reference system, Newton's Lex I seems rigorously fulfilled. This state of affairs, however, prevails only for a limited time. After about 5 minutes, the observer on the satellite will notice (fig. 5) that the consort starts rising until it reaches an elevation of about 17° above the "horizon" (the projected horizontal plane of the ship). Then, it will drop, cross the horizon, pass through the nadir, come up behind the ship, and will continue this spiraling motion in an ever widening trajectory until it finally disappears behind the earth. The consort will then remain invisible for some time and finally appear from behind the earth on the opposite side of where it disappeared, this time engaged in a narrowing spiral down toward the satellite until it hits it or scores a near-miss.

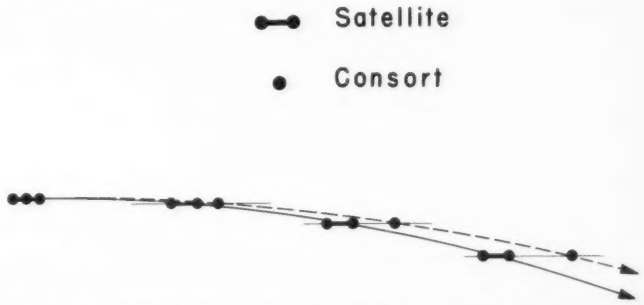

Figure 4. Initial phase of tangentially forward throw showing apparent straight-line motion of consort as seen from satellite.

It is seen that the observer on the space platform is confronted with a very strange type of kinematics indeed. For him, Newton's Lex I is valid only for the first 5 minutes after the onset of any free motion. Thereafter the rectilinear metric of space appears to change into a curvilinear one of spiral character. It is interesting to notice that for a larger or smaller launching velocity the initial phase within which rectilinearity of free motion is preserved changes only with regard to the spatial parameters, but not with regard to time. The characteristic time interval always remains, for the special orbital parameters under investigation, 5 minutes. For higher launching speeds, rectilinearity simply extends over larger distances and for lower speeds correspondingly over shorter ones.

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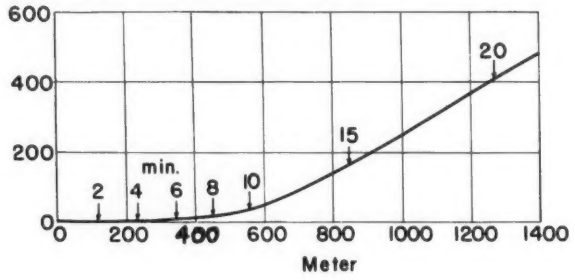

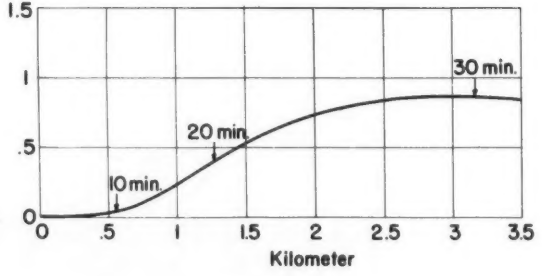

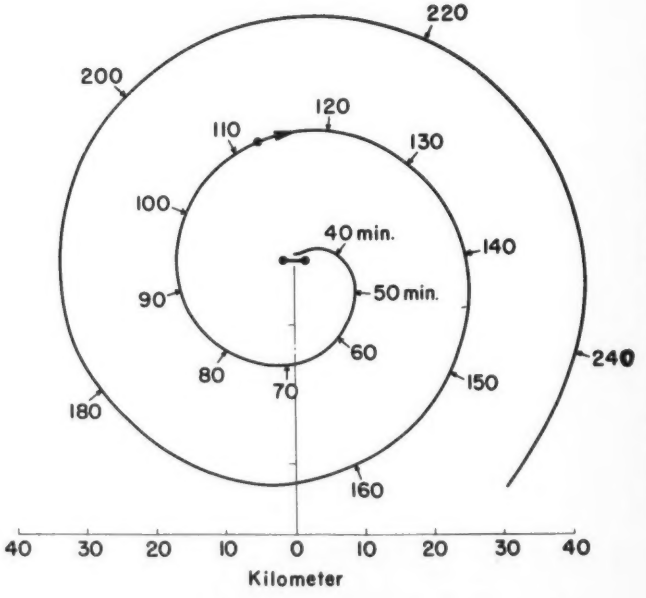

Figure 5. Complete orbit of consort for forward throw of 1 m/sec as seen from satellite.

A general theoretical analysis of the phenomenon of apparent initial rectilinear motion is beyond the scope of this discourse. Yet it should be mentioned that the phenomenon exists only in systems in which both the orbit of the satellite and of the consort are exclusively determined by the central gravitational field of the planet which they circle. As soon as the mutual attraction of satellite and consort exerts a noticeable influence on the orbits, the apparent rectilinear motion becomes disturbed. How well the condition of the central gravitational field as the sole orbit-determining force is fulfilled for an earth-circling satellite at 500 km height, can be seen from a comparison of the respective field strengths on the surface of the satellite.

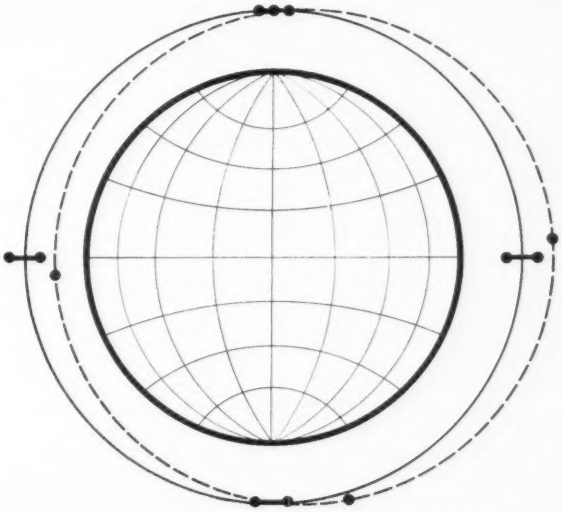

Figure 6. Consort orbit for radially "upward" throw.

Assuming spherical shape, a weight of 100 metric tons, and a mean density of 1.0, one obtains a gravitational force on the surface of the satellite of 8×10^{-8}G produced by the mass of the satellite itself whereas the earth's field at the same location amounts to 0.86 G. This is a ratio of forces of 1 to 10 million. For any other point inside or outside the satellite this ratio becames even larger. As the other extreme, the conditions on the surface of the moon could be visualized. There, the moon's attraction produces a field strength of $\frac{1}{6}$G and the earth's field equals 2.75×10^{-4}G. Consequently, the trajectories of thrown or freely falling objects on the moon are exclusively determined by the

Figure 5. Complete orbit of consort for forward throw of 1 m/sec as seen from satellite.

moon's own gravitational field, contrary to the situation on an earth-circling satellite where the earth's field is the sole directing force.

As was stated previously, two limiting cases stand out among the infinite number of ways of throwing an object from one satellite to another, 2 km "back." The analysis of the first was given above. The second will be described now. Figure 6 depicts the basic geometry. The consort is launched "vertically upward" in terms of the reference system of the observer on the platform, or "radially outward" in terms of the orbit. Δv, the launching speed, now forms a right angle with the orbital motion of the satellite and therefore has to be added vectorially to it. Evidently, the angular speed of the consort does not change, at least not during the first infinitesimal time interval after launching. However, the consort does change its radial distance from the earth, from the very first moment. As a consequence, its circular orbit changes into an elliptic one. This in turn causes a decrease of orbital speed according to Kepler's Second Law, which states that the radius vector sweeps equal areas in equal times. The consort thus is seen to fall back, after launching, in angular position behind the satellite. This goes on for 90° of travel until the apogee is reached. At that point, the consort travels at minimum speed and reverses its radial motion. It now begins to fall back toward the earth, thereby gaining speed and making up for the loss of speed suffered in the first quarter. At 180°, the consort's angular speed has become equal to that of the satellite. However, the consort reaches this position later than the satellite, since its speed, during the full first half of orbit, has all the time been smaller. The radial distance from the earth at 180° will be equal to that of the satellite; both orbits intersect at that point. Yet both bodies will not pass through that position at the same time, as has just been stated. If the correct launching speed was chosen, the desired distance of 2 km will be accomplished at the 180° point. The "vertically upward" throw thus is seen to fulfill the task of throwing an object back 2 km, in half the time and length of travel than the "forward" throw.

The consort motion in the second half of the revolution is the exact counterpart of the first half. The radial distance and corresponding speed at any angle $180° + \varphi^*$ are identical to the ones at $180° - \varphi$, whereas the rate of change of these magnitudes has the opposite sign. At 360°, conditions identical to those existing at the moment of launching are restored. This latter fact stands in contradistinction to the

*φ is the angular position of the radius vector measured from an initial position $\varphi = 0$.

forward throw which was shown above to lead to a progressive change of the mutual positions of consort and satellite from revolution to revolution. For this earlier case, a restoring of the original parameters can occur only after many revolutions and only for certain singular values of the launching speed that produce integer multiples in the periodicity. For the upward throw a strict one-revolution periodicity exists and holds for any arbitrarily chosen launching speed.

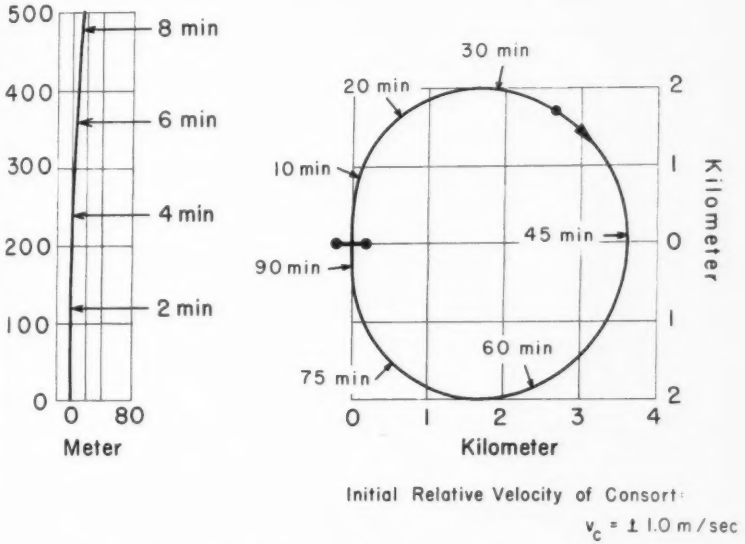

Figure 7. Complete orbit of consort for upward throw of 1 m/sec as seen from satellite.

In view of this basic difference of the two cases, it is intriguing to investigate, for the vertical throw, the apparent motion of the consort in terms of the observer on the satellite as reference system (fig. 7). Again the consort maintains apparent rectilinear motion at constant speed for the first 5 minutes after launching. This is especially remarkable inasmuch as in this case the motion is carried out in radial direction, that is, against the gravity attraction of the earth. As can be read from figure 7, a consort launching speed of 1 m/sec leads to a distance of 3.6 km at the intersect of the two orbits at 180°. If a distance of 2 km is desired, as specified in the original problem, a launching speed of 2/3.6 x 1 m/sec=0.56 m/sec would be correct.

As has been pointed out before, the radial and tangential launch-

ing directions are the limiting cases of a full continuum of possible angles. The analysis of this general case, in which the launching speed has a tangential and a radial component, is more complex and shall not be carried out in full here. An attempt to indicate the properties of the consort orbit is made in figure 8. The angle between launching point and perigee can now assume any value between 0 and 90° depending on the launching angle. The angles, however, are not equal, but connected by a more complicated relationship. Similarly, the angular distance to be traveled and the corresponding time can assume any value between 180° and 360° or half and full revolving time, respectively.

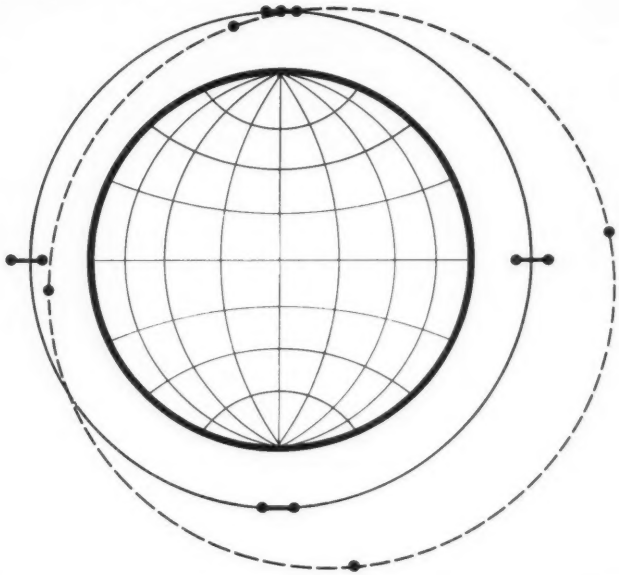

Figure 8. Consort orbit for obliquely "forward and upward" throw.

Finally, it should be mentioned that besides this just discussed range of 90° of possible launching angles other allowed launching directions exist for accomplishing the task. The resulting transfer ellipses even achieve the goal over angular distances of less than 180° and in correspondingly shorter times. The required launching speed, however, increases considerably, and so does the relative speed of arrival at the second ship. The most extreme case in this respect is the backward throw directly toward the second ship. Required

launching speed in this case equals full orbital speed; the consort arrives at the second satellite with the same relative speed, somewhat over 7 km/sec. It certainly could no longer be caught by hand.

CONCLUSIONS

It will be left to the imagination of the reader to embellish the various aspects for the life of a man or a crew on a space platform. Only one particular consequence will be mentioned: it is impossible to place a loose assembly of parts or objects of any kind in orbit and ensure their staying together in the original array. Even if the initial relative speeds of such objects toward each other are absolutely zero, the fact that their respective centers of gravity will have slightly different distances from the center of the earth inevitably assigns them different orbital parameters. As a consequence, such an assembly will start spreading immediately after it has been set free, and, though certain positional periodicities might occur, the complete original array never will be restored. On the other hand, it requires only minute binding forces to tie such objects together in a way that they act as one body with one center of gravity. Here again, the small muscular power of man, or a string of only grams of tensile breaking strength, can control objects of tons of inertial mass.

SUMMARY

In an orbiting satellite of finite size, the completely gravity-free state, that is, full balance of centrifugal and gravitational forces, is realized only in the center of gravity of the vehicle. At points radially inward or outward of this center, small gravitational forces are felt. They are of the order of 10^{-6} G and therefore entirely negligible, as far as physiologic and sensory effects on man are concerned. They are not negligible, however, as soon as free motions of objects on a time scale of several minutes are involved.

Through the use of a concrete example of intersatellite transportation, the dynamics and kinetics of such motions are analyzed in a simplified way. Two limiting cases, the "forward" and the "upward" throw of an object from the satellite, are analyzed in more detail.

A consequence of more general interest of these relationships is the known fact that it is not possible to put a loose assembly of parts or objects in orbit so that they maintain their original array. As their respective centers of gravity will have slightly different distances from the center of the earth, they will start spreading as soon as they are set free. On the other side, only very small conservative forces are required to keep even very "heavy" objects aligned.

Development and Use of Medical Machine Record Cards in Astronaut Selection

BRIG. GENERAL ALBERT H. SCHWICHTENBERG, USAF, MC (RET.)
BRIG. GENERAL DONALD D. FLICKINGER, USAF, MC
W. RANDOLPH LOVELACE II, M. D.

IN EARLY 1958, the Lovelace Foundation undertook the development of a method of recording on machine record cards detailed medical information for the U. S. Air Force "Man in Space" program. It was believed that an effort should be made to record these medical data in such a manner that easy recall and rapid retrieval of the information would be possible. It was thought that this could facilitate the selection of astronaut candidates and in a larger sense possibly indicate better ways of medical data recording and handling. It should be noted that the "Man in Space" program was later given to the National Aeronautics and Space Administration. This method of data recording and handling was selected for use in connection with their astronaut selection program because of the ease with which this information could be used in the future.

It was planned to survey the various International Business Machines Corporation medical data recording programs which were assumed to be in use. This was to be followed by a process of adapting appropriate portions of these to the specific needs of the "Man in Space" medical data recording and processing problem. However, contrary to all assumptions and expectations, it was soon discovered that there had apparently been very little actual recording of medical data as such, on machine record cards, and none in any great detail, such as this project would require.

Woodbury [1] has emphasized that all the life sciences have the following in common: "Something is observed, something is selected for

From the Lovelace Foundation for Medical Education and Research, Albuquerque, New Mexico. This work was supported by a contract with the U.S. Air Force Research and Development Command. Presented in part at a meeting of the AGARD Aeromedical Panel, Aachen, Germany, 21–26 Sept. 1959.

recording (sampled), something is recorded in some form or other (coded), something is done to it (analysis), or it is put away for further use (stored), and in most cases used later (retrieval)." A major reason for slow utilization of revolutionary improvements in data handling in the life sciences has been lack of personnel familiar with the use of such equipment and with what type of processing is appropriate once the computer stage is reached.

The use of machine record cards for recording medical data for examinations or on patients represents a radical departure from the handwritten medical record which has long been traditional in the medical profession. For many years there have been innumerable complaints about handwritten records. Three of the more serious shortcomings of this method of recording are: It is much too time consuming; the records are often at least partly indecipherable; and the retrieval of information is both laborious and time consuming to the point that much needed clinical research is impractical. In all probability, there is no panacea to this problem. It is recognized, moreover, that individuals cling tenaciously to the traditional methods that have been taught them. This is partly because a good deal of effort is expended, at least temporarily, in making changes. Yet it is clear that sooner or later something will have to be done to systematize medical records. Perhaps the logical place to start is in the medical schools.

The study and development described below suggest a direction in medical recording in which further effort appears warranted. In a larger sense much data recording in the broad field of life sciences is susceptible to this treatment, which renders modern data processing and computer use feasible. This study was undertaken here for the specific purpose of the "Man in Space" or astronaut selection program. At the same time, it was thought that such a systematic approach to medical recording should also be compatible with future general clinical and hospital use, perhaps in the Air Force Medical Service, as well as in civilian medicine. In addition, consideration was given to the possible future use of medical machine record cards with special medically programmed computers as diagnostic aids for problem cases. This is mentioned because data to be used in a computer must be in readily retrievable form, such as machine record cards or tape. Machine record card data may be recorded on tape automatically.

Of interest to medical administrators in clinics or groups with fixed charges for various clinical tests and procedures is the possibility of rapidly and automatically computing itemized charges by processing a deck of punched cards on a discharged patient through a business

machine. Various statistical records can be compiled at the same time.

Over the past several years, there have been individual efforts by physicians and groups to adapt modern machine methods for records and data processing and handling, now widely used in business, to the various fields in medicine. Perhaps most notable of these has been the use of machine record or IBM cards in the medical indexing of patients by diagnosis. Such procedures have greatly facilitated medical research by making possible the quick, accurate, and easy recall of records by diagnosis and the selection of appropriate cases for study. This has reached a high state of development at the Mayo Foundation and Clinic under Dr. Joseph Berkson and at the M. D. Anderson Hospital and Tumor Institute, Houston, Texas, under Dr. R. Lee Clark, Jr., and Miss Eleanor McDonald, the director for biometrics and records. Several additional clinics and groups have also developed various other applications of the modern business machines to their administrative efforts, with reported savings in personnel and costs.

Dr. Logan Robertson of Asheville, North Carolina, as far as can be learned, has made the first concerted effort to use machine record cards in actually recording medical data in practice He designed cards to record on a considerable scale the medical history, physical examination, and laboratory data on patients. He also made early use of the IBM mark sense card approach for recording such medical information. Excellent materials and advanced methods have been developed under his auspices during the past 6 or more years. His technics were particularly adapted to an industrial medical service, but could also be used with some modification in the usual practice of medicine.

MACHINE RECORD CARD RECORDING OF MEDICAL DATA

Coded Work Sheet and Card Punch Operators

It became clear in considering the problem of possible ways of recording medical information that either one of two general methods might prove suitable.

The first method involves developing a work sheet upon which the desired information is noted by the examining physician or a technician according to a prearranged code suitable for machine record card recording. This information is then recorded on standard machine record cards by card punch operators who have been especially trained to accomplish this procedure from such a work sheet. This system has a number of advantages in that it is simple and straightforward in its approach, once it has been developed and is understood by all concerned. A maximum of information is stored on

each machine record card so produced. This can be of economic importance when the storage problem is considered. It tends, however, to require the ready availability of trained IBM card punch operators, together with certain equipment, even for a small operation.

Sample work sheets showing this approach had been developed in connection with a proposed "Care of Flyer" program under the auspices of Captain Ashton Graybiel, MC, USN, director of research of the U.S. Naval School of Aviation Medicine, Naval Air Station, Pensacola, Florida.[2] They were kindly sent to one of us (A.H.S.) by Dr. Graybiel in August 1958. Two of several of his medical work sheets are shown in figures 1 and 2. Figure 1 is a part of the history, which will go on one machine record card, and figure 2 is a part of the physical examination, which will also go on one card. Some of his ideas were helpful in developing the master card for the present program, which requires a punch card operation.

The card punch operator uses these work sheets as the source of data. The usual card punch operation is carried through, and regular machine record cards are produced. The cards are then verified by the standard methods, familiar to all who have experience with this common form of data gathering and processing. These methods are described in detail in IBM publications and need no further discussion here.

The disadvantage of this system is that the machine record card, with this coded information punched in, has no meaning to a physician who may wish to obtain data directly from the card unless he is extremely familiar with the codes used and has had considerable experience in the use of the particular cards. For this purpose, either work sheets must be retained for reference or special so-called read-out equipment must be available. This is not necessarily an insurmountable objection inasmuch as an examination form or other medical forms can automatically be printed from such data, if the volume warrants the cost. In some applications easy read-out of information is not vital, as for example, when the cards are used subsequently only for various correlation and statistical studies that rely entirely on machine operations. Further development of this approach for recording physical examination data and for other general clinical use seems indicated. It has many possible uses also in recording data in the life sciences.

Mark Sense Type Cards and Automatic Processing

The second major approach at this time for recording information on machine record or IBM cards is the use of the mark sense method.

REPORT OF MEDICAL EXAMINATION (AVIATION)

Numbers refer to IBM card columns
*Code directly, **code directly per nomenclature, #code per key
@not coded, (x) x-overpunch. Where possible circle pertinent data.

Card 1-col 1-2 card number; col 3-8 identification number

Name@: last - first - middle	3-8 ID no.*	9-14 Date of exam.* (day month year)

Home address@	15 Rank/rate#	16 Classifications#
	Ens,2nd Lt.N/C,Rct code 0	Officer USN code 0
	Ltjg,1stLt,SA,PFC 1	USNR 1
17-22 Birthdate*	Lt,Capt,SN,Cpl 2	USMC 2
(day month year)	3rd class PO, Sgt 3	USMCR 3
Birthplace@	2nd class PO, TSgt 4	AOC 4
23 race# Caucasian code 0	1st class PO, SSgt 5	NAVCAD 5
Negroid 1	Chief, MSgt 6	Enlisted USN 6
Oriental 2		USNR 7
Indian (Amer.) 3	24-25 Total yrs mil. service*	USNC 8
Malayan 4		USMCR 9

Next of kin@: name, address, and relationship

Medical History

Examinee's statement of health@(list present complaints, major and minor)

Family History

Relation	age (if living or at death)*	State of health#		If dead, cause#	
father	26-27	30	good code 3 poor code 1		32-35
mother	28-29	31	fair 2 dead 0		36-39

Has any blood relation (parent, sister, brother, other) had# (multiple punch if more than one)

40	tuberculosis	43	cancer	46	stomach trouble		none	code 0
41	diabetes	44	kidney trouble	47	rheumatism		father	1
42	syphilis	45	heart trouble	48	asthma, hay fever		mother	2
49	fits, convulsions, epilepsy						sister	3
50	spells of unexplained unconsciousness						brother	4
51	loss of memory or lapses of memory						wife	5
52	Has any blood relation attempted or committed suicide						children	6
53	Has any blood relation been insane						other	7

Have you ever had or have you now:# (no code 0, yes code 1)

54	scarlet fever or erysipelas	61	eye trouble	68	goiter	75	chronic cough
55	diphtheria	62	ear, nose or throat trouble	69	tuberculosis	76	high or low blood pressure
56	rheumatic fever	63	running ears	70	night sweats		
57	swollen or painful joints	64	chronic or frequent colds	71	asthma	77	cramps in legs
58	mumps	65	severe tooth or gum trouble	72	recent gain or loss of wt.	78	frequent indigestion
59	whooping cough			73	pain or pressure in chest	79	stomach,liver, bowel trouble
60	severe or frequent headaches	66	sinusitis	74	palpitation or pounding heart	80	blank
		67	hay fever				

Figure 1. Medical history work sheet, one of several work sheets coded for machine record card punch operation. (Courtesy, Captain Ashton Graybiel, MC, USN, U.S. Naval School of Aviation Medicine, Pensacola, Florida.)

Cards of this type were developed at the Lovelace Foundation. In its simplest form these cards are designed with questions written out, to which answers are made by placing a short pencil line, using a special electrographic pencil, in a nearby space provided for *Yes* or *No*. These spaces are called "race tracks" because of their shape, and can be arranged on the cards so as to take maximum advantage of the available space. An example of the type of cards developed here is shown in figure 3. This is one of 9 medical history cards which

REPORT OF MEDICAL EXAMINATION (AVIATION)

Card 4 Col 1-2 card number; col 3-8 identification number*				
Distant vision#			Refraction* (code - as x - overpunch)	
09 right (20/)	11 corr. to (20/)		13-15 s 19-21	c 25-27 x
10 left (20/)	12 corr. to (20/)		16-18 s 22-24	c 28-30 x
over 20/15 code 0 20/15 1	20/20 code 2 20/25 3	20/30 code 4 20/40 5	20/50 code 6 20/70 7	20/100 code 8 under 20/100 9
Near vision#*				
31 right	33 corr. to	by 35-37	s 41-43	c 47-49 x
32 left	34 corr. to	by 38-40	s 44-46	c 50-52 x
J1 (.37) code 0 J2 (.50) 1	J3 (0.62) code 2 J4 (0.75) 3		J5 (1.00) code 4 J6 (1.25) 5	
Heterophoria*				
Near 53-54 Es° Ex° (x)	55-56 R.H. L.H. (x)		Far 57-58 Es° Ex° (x)	59-60 R.H. L.H. (x)
Prism div. *near 61-62	Accommodation*65-67 right			71-72 PC
far 63-64	68-70 left			73-74 PD
75 Depth perception #	77 Color vision#			79 red lens#
76 intraocular tension#	78 night vision#			80 visual fields#
(normal code 0, abnormal code 1)				

Figure 2. Physical examination work sheet, one of several work sheets coded for machine record card punch operation. (Courtesy, Captain Ashton Graybiel, MC, USN, U.S. Naval School of Aviation Medicine, Pensacola, Florida.)

have been marked by an examinee. It may be pointed out that these mark sense cards may also serve as the work sheets for standard machine record cards, if a code for this is developed for use by the punch card operation. However, this would appear to be some duplication of effort.

The upper horizontal line or row is actually lightly shaded on the cards, but does not show on the reproduction. It is reserved for staff use. The medical history or similar questions may be answered either by the patient alone or more commonly with the assistance of a nurse or medical technician, or the patient may be asked the questions in the usual way and the answers marked in the proper space by the physician. In the latter case, to save time, it is necessary for the physician to mark only the positive findings. The negative finding marks may be filled in later by a secretary, so that if processing is to be done, the machine will not later reject the card for the apparent lack of consideration of the other questions.

In any case, as he reviews the history, the physician indicates by his mark in the proper race track of the upper shaded horizontal line or row whether he considers that the history of each system is, or is not, of significance. Marks in this upper row thus indicate that a physician has reviewed the history. He can initial the card or sign his

Figure 3. Medical history (1 of 9 cards). Can be filled out by patient with assistance of a nurse. Reviewed by physician and indicated in shaded area.

name on the bottom in ink for authentication purposes. Also, if he or the patient wishes to add explanatory comments, they may be written in ink on the reverse of the card. To save time there is a race track at the upper right-hand corner of each card which when marked indicates that there are remarks on the reverse side of the card.

A portion of the medical history so recorded by the patient on the card is shown in figure 3. The positive findings indicate that he has had food intolerances, appendicitis, abdominal distention, jaundice, an abdominal operation (which refers to the appendectomy), diarrhea, constipation, hemorrhoids, and fungus infection. Specific negative findings are also of importance.

Marks in the upper shaded row on the card, shown in figure 3, indicate that a physician has reviewed the card and considers that there are significant gastrointestinal problems; that there are no significant skin problems; and that there are additional comments on the back of the card, as indicated by the mark in the upper right-hand corner. These remarks must be either typed or hand copied on duplicate cards, if they are made, as there is no method at present for otherwise reproducing them. It was of interest in the astronaut examinations that there were fewer additional remarks that were believed vital recorded on the back of the cards than had been anticipated. It is considered improbable that a deck of cards describing a patient or examinee other than in the most general terms can be devised in which no additional notations will be indicated. When the information on the face of the card is less complete, the amount of comment may increase, though this will depend in part on the purpose and completeness of the examination. In all probability, a balance will have to be struck in devising sets or decks of machine record cards for at least two or three different levels of detail for different medical applications. It is relatively easy to design cards to record data in any special field of interest.

Figure 4 shows how numerical data are recorded on mark sense machine record cards, using a laboratory card as an example. This card indicates that the patient had 15.8 grams of hemoglobin per 100 ml, a hematocrit of 46 ml per 100 ml, a sedimentation rate of 3, a white blood corpuscle count of 7,000 per cu mm with a differential count of 52% segmented forms, 5% eosinophils, 41% lymphocytes and 2% monocytes. There were 950,000 platelets. The blood type is 0, Rh negative, with negative C, D, E and DU genotypes. Serologic test, done by the Venereal Disease Research Laboratory (VDRL) method,[3] is nonreactive. There are also comments in ink on the back of this card as indicated by the mark in the upper right-hand race

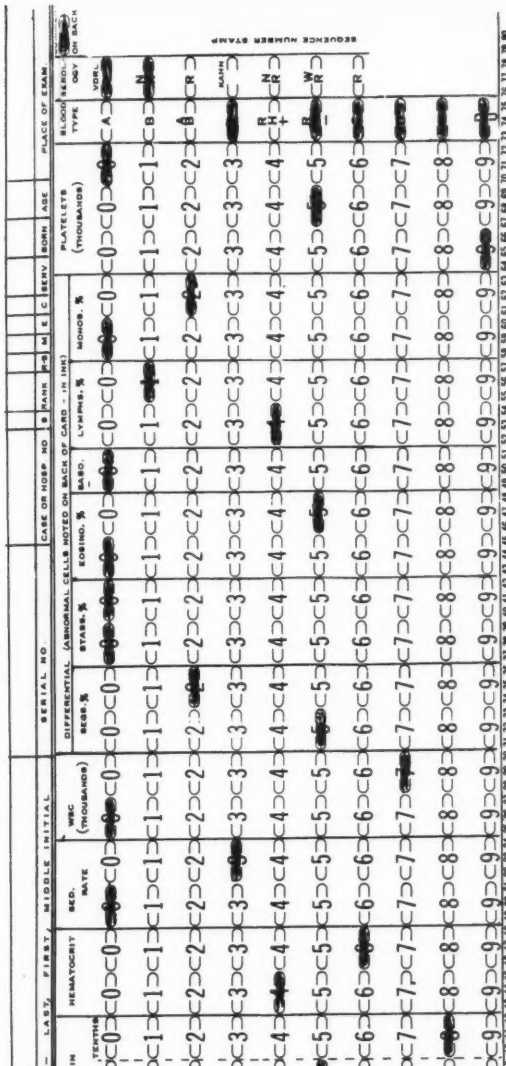

Figure 4. Laboratory tests (1 of 7 cards). Other cards are for gastric analysis, urinalysis, parasitology, blood chemistry, and glucose tolerance.

track. In this case, these comments indicated that there was some spherocytosis, apparently quite a common finding in flyers with high-altitude experience. If certain tests are not done, the spaces are left blank.

Figure 5 shows recording of numerical data on aviation background and is self explanatory.

Figure 6 is an example of the physical examination card. The positive findings are hearing loss, septal deviation, evidence of a tonsillectomy, an abnormal larynx, and hemorrhoids. The examinee is otherwise normal in all respects. This card is more crowded than believed desirable. Experience may indicate that the data on this card should be placed on 2 cards. Again, there are comments on the back of the card which indicate the amount and direction of septal deviation, together with the amount of nasal obstruction; also a description of the laryngeal abnormality and the hemorrhoids. The extent of the hearing loss, together with all other audiology information, is noted on special audiology cards.

Figure 7 is an example of one of a number of special examination cards. This is the cardiology card and is used to describe the electrocardiographic findings in a systematic manner. This has been found desirable for everyday use in our cardiology clinic for all EKG recordings and should later prove useful for further studies.

Machine record cards have also been developed for the specialists' examinations in the fields noted below. After limited experience it became clear they should be revised in such a way that they could be used by themselves in the specialist's routine clinic practice. This causes some duplication in the history, such as in eye, ear, nose, and throat, but is believed balanced by the greater usability. The second generation of machine record cards reflects this change.

It is possible of course to have both types of information; for example, *Yes*, *No* and numerical data on the same card.

As personnel become familiar with the use of machine record cards, many short cuts may be taken to increase the amount of meaningful information which can be included on each card. Also, as experience increases in their design and use, better ways of asking questions evolve, together with increasing selectivity in the questions themselves. Color coding of the cards for different sections makes their daily use easier. There are many color combinations, both solid-colored cards and colored stripes, which enhance the ease of identification. Further advances are doubtless also possible in machine record card handling equipment. The main advantage of the mark sense card approach is that anyone can readily interpret what is recorded, once the simple mechanics of the method are explained.

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Figure 5. Aviation background (1 of 6 cards). Provides all essential information on the patient's flying experience.

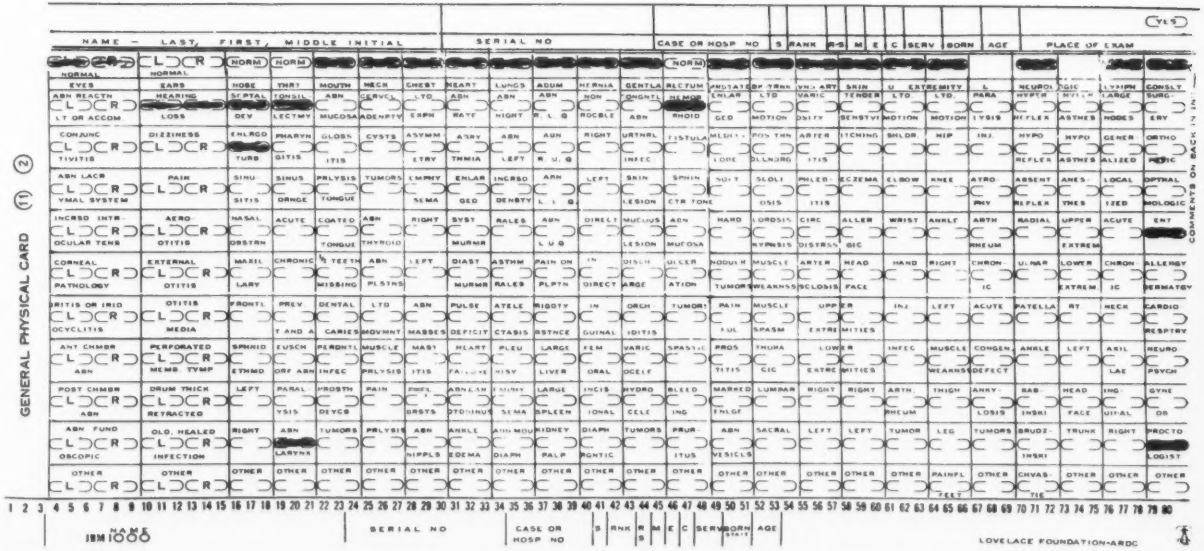

Figure 6. General physical (1 of 2 cards). Filled in by physician.

Figure 7. Special examination (1 of 17 cards). This electrocardiogram card is representative of others on ophthalmology, x-ray, audiology, dental, physical competence, et cetera.

Even with minimum experience one is able to scan these cards very rapidly to obtain the important positive and negative information contained thereon.

These mark sense cards may be punched immediately or not, as desired. As contrasted with the work sheet approach, using IBM card punch operators, these cards are punched automatically by machines. As the card passes through the machine, tiny metal brushes pass over the surface of the card, making electrical contact through the electrographic pencil mark. This electrical contact causes a hole to be automatically punched just below the race track. Thus, no card punch operators are necessary. If marking errors are made on the cards prior to punching, the pencil lines within the race tracks may be erased and replaced elsewhere as indicated. However, by either approach, if errors are discovered after the cards are punched, the card must be replaced with a corrected one in all instances. Once the cards are punched, duplicates can be made very easily.

There are several disadvantages of mark sense cards:

1. The pencil marks must be made with reasonable care and accuracy in the appropriate race track; otherwise, if the cards are to be punched or duplicated, the automatic punching machine may make errors. This can be a serious drawback, just as is carelessness wherever it is encountered in medical recording. A small amount of instruction of the medical staff and experience in the use of machine record cards reduce these relatively minor difficulties. Machine record cards of all kinds should be handled with care to avoid bending and mutilation.
2. Considerably less information can be placed upon each mark sense card, as compared with the standard IBM card, thereby proportionally increasing the storage problem. Information on these cards can be transferred to magnetic tapes automatically, with great saving in storage space. If one has proper equipment, very rapid recall of information is possible. This opens up entirely new possibilities for medical record handling for large operations such as insurance companies. Depending upon the layout of the cards, the skill with which the questions are asked, or the number of digits to be used in recording numerical data, it is estimated that only about one-fourth to perhaps at most one-half as much information can be recorded by the mark sense method on each card as by the usual coded IBM card method using work sheets and punch card operators.

One approach or the other may be favored, depending upon personal preferences, specific requirements, and the size and type of medical operation being considered. If easy read-out is desired without equipment, the use of mark sense cards appears the more attractive. This seems to be the case in ordinary clinical use. If storage is a problem, and easy read-out is not an overriding consideration, the work sheets and standard IBM cards have some advantages. The work sheets may of course also be used as the clinical record, cards being punched later. This entails some duplication, but less than does

typing the written clinical record, as is now frequently done. If both are stored, this again increases the storage problem.

After weighing the advantages and disadvantages of one general approach against the other, it was decided that the mark sense approach would be the more useful for the astronaut selection program and possible subsequent clinical use as well, even with the known disadvantages.

The main reasons which favored the decision to use mark sense cards were as follows:

1. They are easy to use and understand. Marking mistakes are easily apparent, and corrections are easy to make prior to automatic punching. Most patients should have little or no trouble answering questions correctly, especially with assistance from the nurse, medical technician, or physician. Experience with astronaut candidates indicated this was true.

2. They are easy to read. Everyone concerned can tell at any time, without equipment, what has been recorded, both in answers to the questions and in the numerical data. In this instance, for example, duplicates of these cards were to be sent to the Aero Medical Laboratory, now Aerospace Medical Laboratory, Wright-Patterson Air Force Base, Ohio, for their information on the candidates who were undergoing stress tests there, just after completing their medical examinations at the Lovelace Foundation and Clinic.

3. Correlation, statistical, and other studies can be made as easily with these cards as with any other IBM cards.

4. Additional notes or comments may be written in ink on the back of the cards and the presence of such notes indicated on the front of the card. At present these will have to be copied on the back of the duplicate cards.

5. They appeared to be more readily adaptable to clinical practice in the future, both in the office and probably in the hospital as well. There are several ways cards may be inserted in existing clinical folders. They may be T-slotted on the end and inserted with standard plastic ring binders on one edge of the standard folder. They cannot be machine processed after this, however.

6. They can be used just as marked by a physician in his office, authenticated, and retained as permanent records, without further processing. They may be automatically machine punched, at any time, if duplicating or further data processing is desired.

7. No standby expensive card punch operator and equipment are required for small operations. If duplicates are needed or if data processing is to be undertaken, the cards could be punched automatically at a convenient time. If the volume is small, equipment time may be rented from a nearby IBM facility, thus keeping costs to a minimum. In the U.S. Air Force nearly every base has IBM equipment. Thus, processing could be locally accomplished, as a rule, were these medical machine record cards adopted for use on Air Force bases.

8. Finally, it seemed that they would be adaptable for use with a medically programmed computer to provide the most statistically probable diagnoses in the order of probability. Developmental work is being done on this interesting project.[4,5] The use of machine record cards or some similar type for medical data recording is a prerequisite for future computer use. A programmed computer for this purpose would be one in which the large body of medical knowledge has been placed on memory drums or other storage systems. It is considered

possible that for very difficult diagnostic problems a physician could some day fill in such a deck of the machine record cards with all the information available on his patient and send them to a medical center with a specially programmed computer offering this service. Knowledge of the several most probable diagnoses in order of their probability would provide guidance for further diagnostic work to narrow down still further the various possibilities. The task of programming such a special purpose computer and keeping it current with new medical knowledge could possibly become a future function of the National Medical Library. Such utilization of machine record cards and memory devices would require the development of more broadly acceptable standardization of medical terms. It is believed that many new and as yet undreamed-of developments which will aid the physician or scientist can stem from better medical data recording and handling technics. The advantages of the application of modern data processing cannot be fully known until after some years of use and development.

DEVELOPMENT OF CARDS FOR THE ASTRONAUT SELECTION PROGRAM

The decision to use mark sense cards having been made, it followed that a deck of machine record cards would have to be developed for the astronaut selection program. All the medical and other data that was believed meaningful, or that could possibly prove meaningful in the future, would have to be included. This meant a maximal rather than a minimal amount of information would have to be recorded. It was recognized in the beginning that medical information which would prove meaningful for future astronaut selection could be finally determined only on the basis of experience with individuals in high-altitude, high-performance aircraft, and more particularly after actual space flight. To some extent also, such information will be meaningful in the light of the specific data one has on hand concerning the first test group. With experience it should be possible in the future to reduce the amount of information now being collected for this initial selection program to what will prove most useful later. On the other hand, it is probable also that some of this may be replaced by other needed data not recognized now as important. Subsequent generations of machine record cards will reflect these changes.

For ordinary clinical or office use, a deck of machine record cards with considerably less detail would be indicated and could be developed easily. However, for possible future use with a computer, detail at least comparable to that for this development would appear indicated because as the number of bits of information increases, the accuracy of diagnosis tends to improve.

The various steps involved in devising machine record cards for this purpose proved to be not extremely difficult, but very time consuming. The assistance of many physicians in the several specialites and of

staff members of the Lovelace Foundation and Clinic was employed to the utmost to insure that the important aspects of their respective fields were covered by the data on the machine record cards. In addition, the standard texts on medical history-taking and physical examinations were used. Nearly all participants had had experience in the field of aviation medicine.

Once the practical problems and fundamentals had been learned, the IBM supplies division Form X74–4815–0, entitled "IBM Card Layout Form-Horizontal Mark Sense," was found to be a most useful aid. After the card layouts had been designed, it was decided to use the photo-offset printing method because of the relatively small number of copies to be printed of each of the first generation of IBM cards. Actually, 500 of each card were printed. It was believed certain that practical use would suggest a number of changes, and this proved to be the case. It should be emphasized that once machine record cards have been standardized for a given purpose, IBM printing plates are made, markedly reducing the cost of subsequent printing.

It was at this point that the broad experience of Dr. Robertson and his staff proved a key factor in the developmental process. It is considered doubtful that the project could have been completed in time without their skilled assistance and untiring efforts or without those of the photo-offset printer there, who worked closely with this project. Dr. Robertson's organization constitutes what is believed to be the first IBM Medical Service Bureau in existence.

Recently the IBM Corporation has devoted a special section of its research staff to medical applications of modern business machine technics. It is expected that this will prove most helpful for the further development of improved medical recording and data processing for clinical uses, as well as broader applications in research in the biologic or life sciences generally.

To begin with, it was thought that the specific information required for the "Man in Space" program was quite generally an extension of that now considered necessary in aviation medicine. In addition, the dynamic physiologic tests to determine the maximum effort that could be safely exerted, expressed in terms of several variables, were considered most important. These are carried out by Dr. Ulrich Luft as part of a research program of the Lovelace Foundation. It was considered also that the stress tests being conducted at Aero Medical Laboratory together with psychiatric and psychologic tests and full anthropologic data would be necessary. Consequently, machine record cards were designed and used to record the results of these data.

ASTRONAUT SELECTION

When the National Aeronautics and Space Administration was given responsibility for the "Man in Space" program and Project Mercury came into being, the medical requirements were reconsidered. Thus, certain medical criteria were established by members of the Special Advisory Committee on Life Sciences to the National Aeronautics and Space Administration, meeting together with the representatives of the services at the Langley Research Center, Virginia. Among these were the Air Force and Navy Schools of Aviation Medicine, the Aero Medical Laboratory and the Armed Forces-National Research Council committee on bioastronautics. Fortunately, these requirements were similar to the ones envisioned earlier and were such that the additions could be included with minor alterations in the layouts of machine record cards developed for the Air Force "Man in Space" program, then nearly complete. The time elements were such, however, that the completed cards were received from the printers only a few days before the astronaut candidates arrived.

The cards developed are as follows:

a. Medical personal history: 9 cards
b. Surgical summary: 1 card
c. Family history: 1 card
d. Smoking and alcohol consumption history: 1 card
e. Aviation history: 6 cards
f. General physical examination: 2 cards
g. Exercise response, blood pressure and pulse rate: 1 card
h. Medical specialists' examinations:

Ophthalmology: 6 cards
(2 of these are similar and record refraction, 1 card for each eye)
Otolaryngology: 1 card
Audiology: 5 cards
Dental: 1 card
Cardiology: 1 card
Electrodiagnostic procedures: Nerve conduction time and neuromuscular conduction studies noted on reverse of physical examination card.
Electroencephalography: Noted as normal or abnormal. Abnormalities described on back of physical examination card.
Radiology: 2 cards (1 for chest, 1 for all other). Here the radiologic diagnostic codes developed by A. L. Grabowski, Rochester General Hospital, E. Forrest Merril, University of Rochester Hospital, and Eastman Kodak were used.
Roentgenograms were done as follows:
Chest: PA inspiration, PA expiration, Rt lateral
Colon: Barium enema (high kilovoltage technics used for compression spot films; image intensifier used for fluoroscopy)
Sinuses: Four views for frontal, maxillary, ethmoid, and sphenoid sinuses (localized spot views)
Spine lumbosacral: AP and lateral (obliques when indicated)
Stomach and esophagus (image intensifier used for fluoroscopy)

Teeth: Periapical and bite-wing films

Heart: 35 mm cineradiographs of the heart, using the image amplifier to detect coronary artery calcification. This is a recent development and has demonstrated such calcification very well. Some of the cases in which this has been found have been in the age group under consideration.

i. Laboratory tests require 12 cards, including all tests done routinely; of these 7 cards were used for the astronaut selection. They included the following tests:

Differential (3)	Serology
Hemoglobin	Sedimentation rate
Leukocytes	Sperm count
Hematocrit	Stool examinations (2)
Blood grouping	Urinalysis
Rh factor	Gastric analysis

Special hematology smear studied by hematologist

Biochemistry:

- Cholesterol
- BSP liver function test
- Blood sugar
- 24-hour urinary steroid excretion
- Blood urea nitrogen
- Protein electrophoresis
- Catecholamines
- Protein-bound iodine
- Serum electrolyte studies (CO_2, potassium, sodium chloride)

Bacteriology:

- Throat culture, smear and sensitivity

Machine Record Cards for Stress Tests

In connection with the development of machine record cards to record stress tests, cards for centrifuge acceleration response were needed. Since human centrifuge work is carried on both at the Aero Medical Laboratory and at the Aviation Medical Acceleration Laboratory, Naval Air Development Center, Johnsville, Pennsylvania, it seemed desirable to try to develop cards which would be satisfactory to both acceleration laboratories. It was recognized that these as well as all other cards should be designed so as to record the results of the day-to-day operation in a uniform manner for both laboratories, to facilitate later data interchange. Indeed, it is considered that similar efforts may go far toward becoming a bridge between other kinds of laboratories doing similar work, even in different countries. Many precious hours of research time now consumed by laborious hand data processing may be saved by the innovation of these methods and approaches to data handling, provided such data are recorded in a form which permits this. All the personnel concerned with acceleration, both at Aero Medical Laboratory and at the Aviation Medical Acceleration Laboratory, were most generous of their time

and talents in assisting in the development of usable machine record cards.

An example of a machine record card used to record dynamic physiologic tests is shown in figure 8.

Shown in figure 9 is one of the 9 centrifuge acceleration cards to indicate the kinds of complicated information which may be recorded for the acceleration stress tests. In figure 10 is shown one of the 2 altitude run cards, indicating the variety of detailed information which is recorded on this tress test.

Cards were developed for the following stress tests and other tests which were performed at the Aero Medical Laboratory:

Centrifuge acceleration: 9 cards
Heat stress response: 3 cards
Altitude run with M–1 pressure suit: 2 cards
Bioacoustics noise test performance: 1 card
Bioacoustics sinusoidal vibration: 2 cards
Tilt table test: 1 card
Harvard step test: 1 card
Valsalva test: 1 card
Cold pressor test: 2 cards
Anthropologic data: 8 cards
Psychologic variables: 4 cards

Master Card

Figure 11 shows the master card that is used to record basic information on the patient or examinee, such as name, identification numbers, age, sex, marital status, and race. This card is extremely useful because from it all of the basic information can be automatically printed on the top line of each card in the deck, as well as on duplicate decks, if this amount of processing is desired. Such a card requires a card punch operation. Here the data recording is also quite straightforward. If duplicates are not necessary, a secretary or technician can merely write or type in as much of these data as necessary on the top line of each of the cards. If addressograph equipment is available, information may be printed using the standard printing plates. They may be adjusted so as to print the name and number on the top line on the card face or the entire addressograph plate may be used to imprint the usual information on the backs of the cards.

The master card is also designed to be read directly, except for the name, without the necessity for one to be an expert in IBM methods. This is because the original has the information indicated on the right-hand side, which the card punch operator uses. There is no present method to accomplish this otherwise. This card is described

Figure 8. Physiology examination (1 of 4 cards). This card is used to record physiologic dynamic tests.

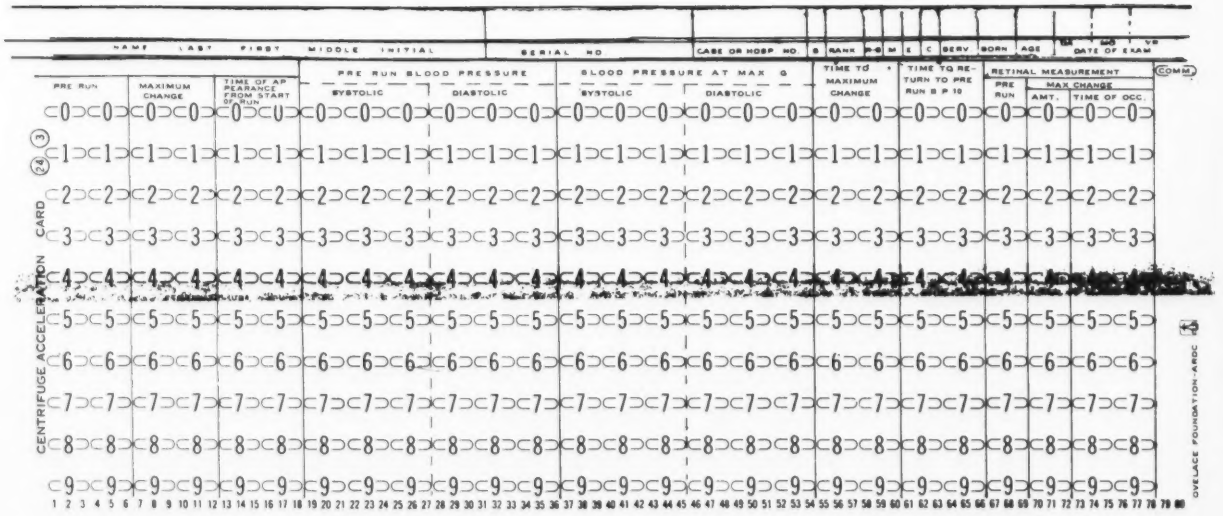

Figure 9. Centrifuge acceleration (1 of 9 cards). This card is used to record stress tests that were developed for use at U.S. Air Force Aero Medical Laboratory, Wright-Patterson Air Force Base.

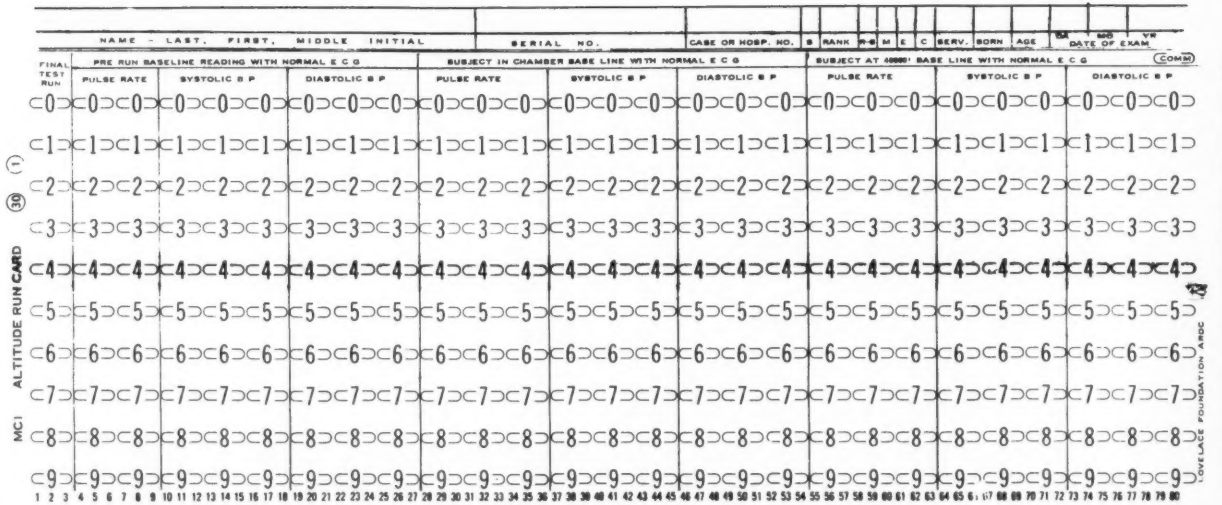
NAME - LAST, FIRST, MIDDLE INITIAL
SERIAL NO.
CASE OR HOSP. NO.
S
RANK
M
E
C
SERV.
BORN
AGE
DATE OF EXAM
FINAL TEST RUN
PRE RUN BASELINE READING WITH NORMAL E C G
SUBJECT IN CHAMBER BASE LINE WITH NORMAL E C G
SUBJECT AT 40000' BASE LINE WITH NORMAL E C G
(COMM)
PULSE RATE
SYSTOLIC B P
DIASTOLIC B P
MCI ALTITUDE RUN CARD (39) (1)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

Figure 10. Altitude run (1 of 2 cards). This card is used to record stress tests that were developed for use at U.S. Air Force Aero Medical Laboratory, Wright-Patterson Air Force Base.

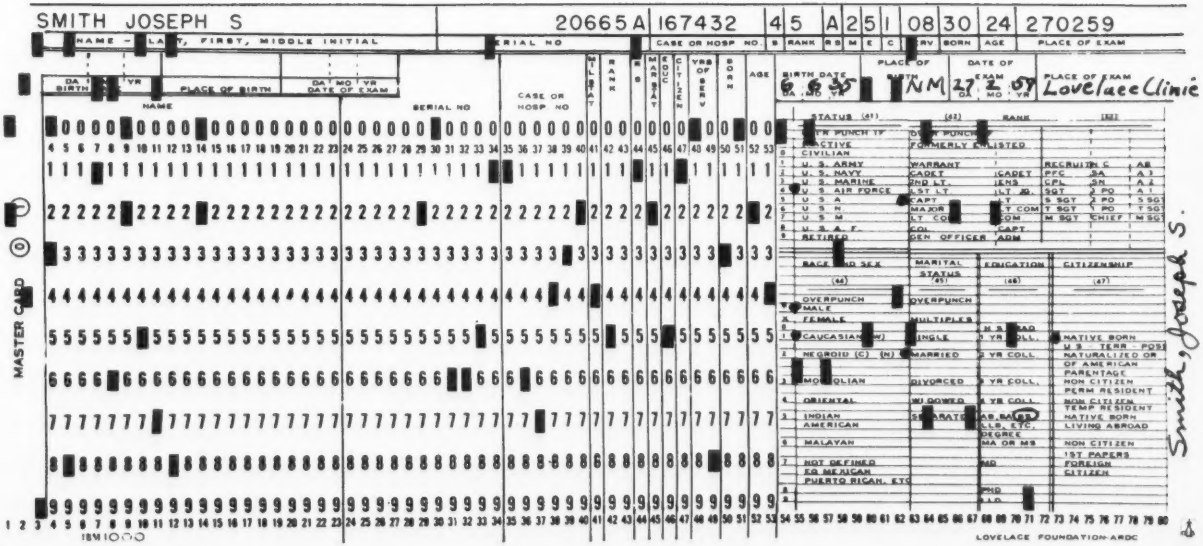

Figure 11. Master card. Unlike most punch cards, data recorded in this system may be verified or read back without mechanical sorting.

briefly, though in a bit more detail than the others, to give some insight into the technics involved in developing such a card and into IBM technics generally.

This card is made up for: Smith, Joseph S., 20665A, a captain, U.S. Air Force; he is married, male, caucasian, with a college degree, native born in New Mexico, has 8 years of military service, was born 6 June 1935, and is 24 years old; was examined on 27 February 1959 and has case or hospital number 167432.

The first vertical columns 1 to 23 are reserved for NAME—last, first, and middle initial.

Since the machine record card is basically a numerical card, in order to derive letters of the alphabet, such as for names, so-called overpunches are used.

The zero horizontal line is called the 10 overpunch line; a horizontal line above this, at the level of the date of birth on this card, is called the 11 overpunch line, and a horizontal line still higher at the level of the name (last, first, etc.) is called the 12 overpunch line. The 12 overpunch line is used in conjunction with numbers 1 to 9 for letters A to I; thus, 12 overpunch with 1 punched equals A, etc. The 11 overpunch line is used in conjunction with numbers 1 to 9 for the letters J to R; thus, 11 overpunch with 1 punched equals J, etc. The 10 overpunch or zero line is used with the numbers 2 to 9 for the letters S to Z; thus, 0 overpunch with 2 punched equals S, etc. It is to be noted that when using the 10 overpunch or zero line, the number 1 line is not used. One then starts with the number 2 line. Using the above plan one can very easily read the name. For spaces between the names, one simply leaves a blank column.

Columns 24 to *34* are reserved for the individual's serial number; in this case the first 5 are straight numerical punches. However, the alpha suffix is overpunched to give the letter, just as in the name. Thus 12 overpunch plus 1 equals A, etc. The serial number then reads 20665A (see top of card).

Columns 35 to *40* are reserved for the case or hospital number. This is self explanatory since it is a straight numerical punch operation.

Column 41 is status, either civilian or military. See the code status (41) on right side of card. Since Smith is an Air Force officer, number 4 in column 41 is punched.

Columns 42 to *43* are reserved for rank, if the individual is in the military service. Column 42 is for officer rank and column 43 is for enlisted rank; if the individual is now an officer and previously an enlisted man, use overpunch (punch 12) in column 42, then punch current rank in column 42 and the previous enlisted rank in column 43. See code in rank column 42 and 43, right of card.

Column 44. Reserved for race and sex. This is shown on the code on right of card for race and sex. Since Smith is a male caucasian, overpunch 12 and 1 is used.

Column 45. Reserved for marital status. See code on right, *Marital Status*. As Smith is married, number 2 is punched. If he had been previously married and divorced, then overpunch and numbers 2 and 3 would be punched.

Column 46. Education. See *Education* on right of card. Since Smith has a college degree, number 5 is punched. Self explanatory, straight numerical.

Column 47. Citizenship. See code *Citizenship* on right of card, straight numerical. Smith is a native born citizen, punch 1.

Columns 48 to *49.* Years of service. Straight numerical. Smith has 8 years of service. Punch 0 in column 48 and 8 in column 49. If he had had 16 years of service, 1 would be punched in column 48 and 6 in column 49.

Columns 50 to *51.* Place of birth. Straight numerical. State or territory or other country in which born is coded on reverse side of card. Number 30 equals New Mexico. Here the code for place of birth is the same as that used by Selective Service.

Columns 52 to *53.* Age. Straight numerical. Punch 2 in column 52 and 4 in column 53, indicates 24 years old.

Columns 54 to *59.* Reserved for date of birth (*Day, Month, Year*). Two columns are for the day, two for the month, two for the year. In this case Smith was born 6 June 1935 and is punched 060635.

Columns 60 to *64.* Also reserved for place of birth. Alpha coded with overpunch for alphabet, same as name. This give *N* space *Mex* for New Mexico.

Columns 65 to *70.* Reserved for date of examination. Two digits for each day, month, and year. In this case the last day of the examination, 27 February 1959, 270259. Straight numerical.

Columns 71 to *80* are unused. They can be used for coding other information if desired. In addition, the top line of the card can be read in the same manner that it is punched by correlating with the matched columns that are punched.

SMITH, JOSEPH S. 20665A 167432 Military Status (4)

Captain (5)	Male (1)	Caucasian	Marital status (2) Married	Education (5) College degree	Citizenship (1) Native born

Years of service Commissioned (8)	Born (State of birth) (30) New Mexico	Age 24	Date of examination 270259 (27 February 1959)

Cards to Facilitate Clinical Use

For completeness, several other special purpose cards were added to the deck to facilitate possible clinical use. One is a diagnosis card with room for 6 different diagnoses using 4 number codes. The international, modified, standard, or military codes may be used. It is only necessary to indicate which code is used in the upper right-hand corner of this card. The physician merely writes the diagnoses on the back of this card in ink, and a medical records clerk converts this to code as is usually done elsewhere, except that the numbers are indicated by mark sense.

Finally, there have been devised a chief complaint card and a present illness card. These are largely blank for the physician to write on. This allows for the wide variation in these fields. On the right-hand side of the chief complaint card is a space for preliminary categorization of the patient in which the major divisions of the International Code are used. This may or may not be used.

525028 O - 59 - 6

These last 3 cards make possible the use of this deck in clinics or physicians' offices. In addition to these, it is thought that the medical history, the physical examination, and appropriate laboratory cards are all that would usually be needed. The cards used to record the results of specialists' examinations would be used only in instances where consultations are indicated and could be added to the deck at any time. Blank cards may be obtained and used to write progress notes if desired. It is considered that a card may easily be developed for this special purpose, indicating the usual conditions the physician notes under these circumstances and also allowing generous space for additional notes.

USE OF MEDICAL MACHINE RECORD CARDS IN ASTRONAUT CANDIDATE EXAMINATIONS

Prior to the arrival of the candidates, cards were prepared with name and number and distributed to the various sections of the clinic involved. The tests and examinations were done on a schedule and the results recorded on the machine record cards. At the completion of the examinations the machine record cards were gathered together from all the departments and reassembled into decks, one for each examinee, and checked for completeness, proper markings, and possible mistakes in recording. Where questions arose, additional consultations or laboratory tests were done as indicated. A written summary of all positive findings and other vital information was easily prepared from the information on the cards and each case considered by a board of physicians, all of whom had some years of background in aviation medicine.

Meanwhile the decks of cards were taken to the IBM facility at Kirtland Air Force Base, New Mexico, where the original cards were automatically punched and a number of duplicate decks made. One of these for each candidate was sent by courier to the Aero Medical Laboratory and used in connection with their examinations. This processing required approximately 2 hours for the 6 examinees seen each week. This is considered a remarkable achievement inasmuch as no similar program had ever been attempted previously. This reflected the skill and devotion to duty of the Air Force and civilian personnel who, because of the timing, did this task almost entirely at night or during week-ends as an important contribution to this national effort.

When all 32 examinations were completed the data were assembled and considered at the Langley National Aeronautics and Space Administration Laboratory by a group that included a representative

from the special advisory committee on Life Sciences to NASA, the Aero Medical Laboratory, the Lovelace Foundation, and officials of the National Aeronautics and Space Administration and Project Mercury. The final selection of candidates was made in light of this by the National Aeronautics and Space Administration.

ACKNOWLEDGMENT: The authors wish to express their appreciation to Mr. R. B. Thomas and Mr. J. W. Titus, the representatives of International Business Machines Corporation in Albuquerque, New Mexico, for their helpful and generous assistance in reviewing the basic knowledge of IBM and mark sense cards and for furnishing the large-size layout forms; and to the Daniels Business Services, of Asheville, North Carolina, who printed the machine record cards.

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THE ART OF HEALING

Hypnosis . . . is in one of its periodic revivals. Better than trying to put the patient into a trance, is unplanned "suggestion," faith and confidence inspired in the patient by the kind of man his physician or dentist is, and an instinctive rapport between the two. Methods of treatment which ordinarily succeed fail when doctor-patient understanding is absent; less certain therapies work well when trust prevails. This is not a technic to be studied, a set of rules to learn. It is an art to be developed. Some men have a natural "bedside manner," and people love and trust them. Others annoy and make sympathetic understanding difficult. The doctor who possesses this quieting power needs far less aid from anesthetics and drugs. *He* is the remedy.—A. B. Riffle: The Mouth: Its Clinical Appraisal; Anesthesia; Drugs; Diet and Nutrition. *American Practitioner and Digest of Treatment*, February 1959.

Case Reports

Appendicitis Treated Nonsurgically at the South Pole

LIEUTENANT VERNON N. HOUK, MC, USN

CONSERVATIVE, nonsurgical treatment of patients with acute appendicitis under suboptimal conditions has been receiving more support in recent years. Bowers, Hughes, and Bonilla [1] presented several case histories, in which all the patients treated initially by nonsurgical measures prior to evacuation later came to appendectomy when transferred to a large hospital. Indeed, even under certain conditions where no evacuation is possible, the nonsurgical management of acute appendicitis is desirable. The present report concerns one such patient at the Amundsen-Scott International Geophysical Year South Pole Station, which is located a few hundred feet from the geographic South Pole and from which no evacuation is possible 9 or 10 months of the year.

CASE REPORT

A 25-year-old man presented himself in the middle of the night with right abdominal pain, vomiting, and diarrhea. The present illness had begun 3 days prior to this time with anorexia, nausea, and some abdominal discomfort. He did not seek medical care initially because these same symptoms had occurred and subsided several times over the past few years; however, they increased in severity until he was acutely ill.

Examination revealed a well-developed, well-nourished white man in rather acute distress. His temperature was 102.8° F; pulse rate, 120 per minute; blood pressure, 110/72 mm Hg; and respirations, 18 per minute and regular. Positive findings were limited to the abdomen which showed 3 plus, right lower quadrant rigidity and tenderness in the right lower quadrant with 4 plus rebound tenderness. The psoas and obturator signs were positive. Rectal examination showed the right side to be hot and tender. No definite mass was palpable. The white blood cell count was 13,800 per cu mm, with a shift to the left, including many young band forms.

The patient was put on complete bed rest, given nothing by mouth, fed intravenously, and given 750 mg of oxytetracycline hydrochloride intravenously every 6 hours over a 3-hour period, and 0.9 mg of atropine. He was watched

From Amundsen-Scott IGY South Pole Station, Antarctica. Lieutenant Houk is now assigned to U.S. Naval Hospital, Bethesda, Md.

carefully and, although the symptoms increased in severity, he was afebrile within 12 hours. There was a marked drop in the number of white blood cells, primarily the granulocytes. The patient remained afebrile. Crystalline penicillin G, 8,000,000 units per day intravenously, divided into 4-hour administrations, and 1 gram of streptomycin sulfate every 12 hours intramuscularly were started. Oxytetracycline hydrochloride was discontinued and he was placed in the Fowler position.

Sixteen hours later the temperature again rose to 103° F, although the white blood cell count remained depressed for 24 hours, when it took a marked, rapid rise with a shift to the left. White blood cell and differential counts were done every 4 hours during this period. After 48 more hours, the symptoms subsided. A mass in the right lower quadrant, suspected upon examination of the abdomen, was definitely felt by rectal examination. The patient's temperature slowly dropped to normal, and after 6 days of treatment he took small sips of tea and broth. The white blood cell count remained around 10,000 per cu mm, with a normal differential. The patient tolerated increased oral feedings well, the mass regressed, his temperature remained normal, and by the end of the 14th day, when the mass was no longer palpable, he was returned to moderate duty. His course throughout the remaining 6 months of his stay at the station was uneventful and he was asymptomatic. He left the station with instructions to consult his private physician upon arrival in the United States.

DISCUSSION

The conditions at an isolated antarctic outpost are indeed suboptimal. The author has had the unfortunate experience of performing a 6-hour surgical procedure on another patient aboard ship under suboptimal conditions. A grossly necrotic cecum and a perforated appendix were found. At the South Pole, however, no oxygen was available for anesthesia. Open-drop ether was impossible because less than 10 feet away from the operating table was an oil burner stove heating the building. The outside temperature was −90°F. The vials of Pontocaine (tetracaine) hydrochloride for spinal anesthesia had been frozen, and although in the dry crystalline state they had coalesced into a solid mass. It was not known whether this material would be safe to use. The author was the only physician present and he had no postgraduate surgical training beyond the internship. None of the other personnel were from any field ancillary to medicine, so that little capable help could be expected. The date was early July, at least 5 months before a plane could land. Because of the above-cited reasons, nonsurgical management was elected.

Although it is not possible to confirm the diagnosis, it is believed that this illness was acute appendicitis in a retrocecal or other pelvic position which progressed to an overwhelming infection (evidenced by the immediate drop in temperature and white blood cell count) and for which oxytetracycline was not the drug of choice. Upon addition of the penicillin and streptomycin sulfate, the fever and the

white blood cell count rose again and then again fell in the usual manner as the infection was controlled. The patient was placed in the Fowler position so that in the event of perforation, the infection might remain localized and wall itself off. Had the patient been less apprehensive, intubation would have been added to the regimen for at least the first 48 hours.

SUMMARY

Another instance of nonsurgical management of what is believed to be an acute retrocecal appendicitis which progressed to an overwhelming infection is presented. After antibiotics were changed, recovery was rapid and the patient returned to his duties at the end of 14 days. It is believed that this treatment was the best possible and that recovery was more rapid than it would have been with operative intervention under suboptimal conditions in an isolated post.

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Transient Pulmonary Insufficiency Caused by Cold

LIEUTENANT VERNON N. HOUK, MC, USN

MEDICAL LITERATURE contains few references to the effects of cold upon the respiratory tract in the absence of generalized body hypothermia. Dogs made to breathe cold air between minus 50° and minus 28° C for periods of 20 to 133 minutes develop a localized sublaryngeal tracheitis, with no evidence of primary injury to the lower portion of the trachea, bronchi, or lungs.[1] Observations on human subjects at rest indicate that cold inspired air at temperatures as low as minus 31° C is rapidly warmed in its passage through the nose, rendering damage to pulmonary tissue unlikely under these conditions.[2] Radiographic studies have demonstrated an increased vascularity of the lungs of experimental subjects exposed to a cool environment.[3] A syndrome of chest pain, cough, hemoptysis, patchy pulmonary consolidation, and fever has been reported in aviators after high altitude

From the Amundsen-Scott IGY South Pole Station. Lt. Houk is now at the U.S. Naval Hospital, National Naval Medical Center, Bethesda, Maryland.

missions during which intensely cold air was breathed.[4] Obstructive edema of the mucous membrane of mouth, nose, and pharynx has been described in an aviator 6 hours after exposure to a stream of air moving at the rate of 160 miles per hour and having a temperature of about minus 50° C, but no pulmonary complications developed.[5]

Although there have been many expeditions into cold areas, it was not until the international geophysical year (IGY) that man was subjected to winter month temperatures on the midplateau of Antarctica. Indeed, at the time of writing, only 36 men have lived in a cold environment of this extreme.

The author spent over a year at the Amundsen-Scott IGY South Pole Station, located at the geographic south pole, at an altitude of 9,200 feet, where the average daily temperatures are below minus 60° F for over 7 months of the year. The extremes in environmental temperature were plus 5.5° F and minus 101.7° F. During only a 5-hour period were temperatures above 0° F recorded. Well over 3,000 hours were colder than minus 70° F, 1,600 hours colder than minus 80° F, 400 hours colder than minus 90° F, and 9 hours colder than minus 100° F. Humidity was estimated to be between 5 and 15 percent; however it is not measurable at the temperatures encountered.

Although outside work was very heavy during the summer period (November until February), the temperature was usually minus 60° F or warmer. At sundown, when temperatures were much colder, some hard physical labor was mandatory for short intervals. Breathing air warmer than minus 70° F was in no instance associated with the respiratory embarrassment produced by colder air during the periods of hyperpnea and tachypnea that the work caused and that no doubt the altitudinal hypoxia increased. No respiratory difficulty was encountered during periods of quiet respirations even in temperatures as low as minus 100° F. Apparently the physiologic protective and warming mechanisms were adequate defense unless hyperpnea and tachypnea—which would tend to augment heat loss—were superimposed.

The symptoms varied in severity with the individual, the temperature, and the exposure time. Of 18 men exposed during the author's sojourn at the station, 15 presented symptoms varying from mild to severe, according to the character of the outside work. Every person who worked outside in temperatures colder than minus 70° F and who had an associated tachypnea and hyperpnea developed the syndrome. Usually only a 4- or 5-hour period of transitory dyspnea, hacking productive cough, and expiratory wheezing occurred. This was associated with copious, thin, blood-streaked sputum, which upon staining showed ciliated and nonciliated epithelial cells, many with large

cytoplasmic vacuoles. With more severe and prolonged exposure, this mild form of injury might progress to symptoms severe enough to incapacitate the individual for several days. The following case history illustrates the most severe form of injury observed.

CASE REPORT

A 28-year-old man who had been at the station more than 9 months (and thus should have been acclimatized if that were possible) was pulling a 75-pound sled through soft snow, the surface of which was marked by very rough sastrugi. The environmental temperature was minus 92° F; the work produced rapid, deep breathing. A definite sensation of "cold," with no element of pain, was noted "deep in the lungs" after about 15 minutes of exposure. When the subject arrived at a warm building, dyspnea, severe cough productive of thin, bloody sputum, and loud expiratory wheezing that could be heard at some distance were noted. The symptoms rapidly increased in severity for 3 hours. There was no past history of pulmonary difficulty or asthma. Examination showed a well-developed, well-nourished white man in rather acute respiratory distress. Temperature was 97.4° F, pulse 120, blood pressure 130/80 mm Hg, and respirations 34 per minute, deep and labored. Cyanosis of the nail beds and of the lips was noted. The thorax heaved during respirations. Percussion of the chest revealed general hyperresonance. On auscultation expiratory wheezes were heard; the expiratory phase was prolonged so that the inspiratory-expiratory ratio was 1 : 3. Ronchi were heard over the entire chest. No other abnormalities were noted.

The patient was placed in bed, but orthopnea was so severe that the sitting position was necessary for approximately 12 hours. He was treated with large doses of cortisone and antihistaminics for the first 24 hours to no avail, but after that, the sublingual administration of 10 mg of Isuprel (isoproterenol) hydrochloride gave partial relief, better than that produced by Isuprel inhaled by hand nebulizer. No relief was obtained from subcutaneous administration of epinephrine. Oxygen was not available. Sputum production was initially 2 cups per day but decreased in amount over a 5-day period; the sputum was grossly bloody to bloodstreaked, and staining demonstrated many ciliated and nonciliated epithelial cells with vacuolated cytoplasm. The patient remained in bed for 3 days, the symptoms gradually subsiding, until, at the end of the sixth day, they were absent and he was able to proceed with his normal duties.

COMMENT

It is felt that the above case history illustrates a new etiologic basis for pulmonary insufficiency of a transient nature due to cold damage to the bronchial tree including its smaller divisions. Although large doses of cortisone and of antihistaminics were tried in several individuals presenting mild to severe forms of the injury on the theory that the symptoms might be the result of bronchial spasm from cold hypersensitivity, these drugs were of no therapeutic value. Isuprel, the only bronchodilator drug used, in all instances gave greater relief

on oral administration than on nebulization. It is unfortunate that no roentgenograms, respirometry, gas exchange, or blood saturation determinations could be performed, and that oxygen administration was not possible.

It is hoped that this report will stimulate the pulmonary physiologist to consider cold as a cause of pulmonary insufficiency. The subject is of military importance because, judging from the author's experience of more than a year, troops operating in temperatures below minus 60° F may encounter a high casualty rate from this injury.

SUMMARY

A new etiologic basis for acute pulmonary insufficiency has been reported. A case history of transient injury to the bronchial tree caused by deep breathing in extremely cold environmental temperatures has been presented. It is believed that this injury deserves careful study because of the degree of disability, and because of the significance of the phenomenon, particularly in military life.

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Urethral Hemangioma

CAPTAIN WILLIAM MORRIS, MC, USN
COMMANDER BURDICK G. CLARKE, MC, USNR
LIEUTENANT GEORGE FERRE, MC, USN

HEMORRHAGE due to urethral hemangioma may be difficult to control. The rarity of this condition and the satisfactory results obtained from treatment by fulguration prompt reporting of the following case.

From U.S. Naval Hospital, Great Lakes, Ill., and Department of Surgery, Tufts University School of Medicine, Boston, Mass.

CASE REPORT

A 20-year-old Army sergeant first consulted the medical officer in November 1957. For several days, there had been bleeding from his urethra, unaccompanied by any other symptoms. Blood was observed on his underclothing, and with each urination he passed a small clot followed by clear urine. An indwelling urethral catheter was left in place for a few days and the bleeding stopped. He was well until March 1958 when the same symptoms recurred. At this time cystoscopy was performed under local anesthesia and what appeared to be several urethral hemangiomas were lightly fulgurated. He bled again several weeks later but stopped after several days of indwelling catheter drainage. Vitamin K was prescribed empirically and he remained well.

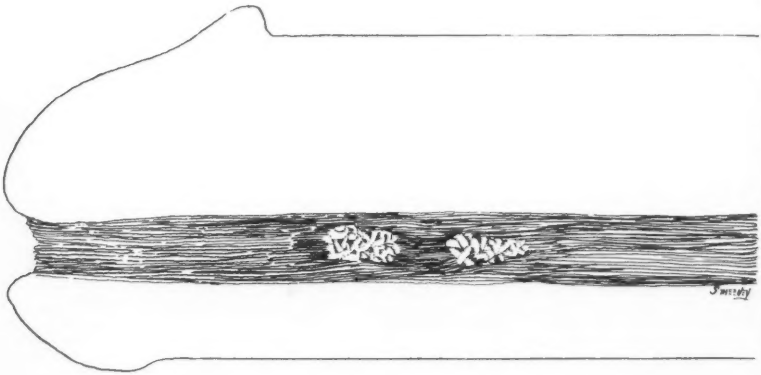

Figure 1. Sketch of urethral hemangioma, preoperatively, as seen with the urethroscope. (Courtesy Gerald F. Sweeney, HM2, USN)

In June 1958 he was studied again. The past history, except for measles and mumps during childhood, was uneventful. The general physical examination was normal and revealed no hemangiomas in other systems. Urinalyses and blood counts also were normal. Under spinal anesthesia, endoscopic examination of the urinary bladder showed normal structures. The McCarthy panendoscope disclosed two hemangiomas within the right lateral wall of the midpendulous urethra. They appeared as slightly raised nests of delicate thin-walled veins just beneath the urethral epithelium, and were about 0.5 by 1 cm across and about 1 cm apart (fig. 1). Although the lesions had appeared turgid and deep blue when examined under topical anesthesia, they appeared pale and collapsed after administration of a spinal anesthetic. The fulgurating current of the Stern-McCarthy electrotome was applied to both lesions, care being taken not to encircle the urethra with burn. In order to minimize the damage to the urethra, tissue was not excised for biopsy.

The patient was re-examined again in April 1959, after discharge from military service. He had no complaints, and voided with an excellent stream. There had been no further bleeding. Urinalyses, urine cultures, a Papanicolaou stain

of the urinary sediment, microscopic examination of the fresh prostatic secretion, and a general physical examination yielded findings within normal limts. Cystourethroscopy showed normal structures. There was no evidence of hemangioma or stricture.

SUMMARY

In cases of bleeding from the urinary tract, a thoughtfully taken history will often indicate the probable site. A case is reported of urethral hemangioma which was manifested by urethral bleeding and which was satisfactorily treated by electrosurgical fulguration.

Chickenpox Pneumonia Treated With Steroids

CAPTAIN WILLIAM L. BAIRD, JR., MC, USA

CHICKENPOX PNEUMONIA is usually a severe and occasionally a fatal disease. A review of the literature reveals 54 cases of primary chickenpox pneumonia with 9 deaths.[1-24] Of the 9 deaths, 5 occurred within 3 days after onset of the pneumonia.[12, 17, 23] There have been 3 cases of chickenpox pneumonia in which steroids were used.[13, 17, 24] A fourth such case is reported below.

CASE REPORT

A 28-year-old white soldier was admitted to this hospital on 9 February 1959 at 1400 hours with chickenpox. On 3 February, he had developed mild respiratory symptoms. On 7 February, he experienced malaise and developed an eruption which began on the trunk. He stated that he believed he had had chickenpox as a child. During the preceding month, three of his children had had chickenpox.

On admission the patient was acutely ill. His temperature was 103° F; pulse, 102 per minute; and the blood pressure, 128/70 mm Hg. There was an extensive skin eruption. The majority of the lesions were vesicular, with a surrounding zone of erythema. All stages of development with papules and pustules were present. The buccal mucosa revealed several small ulcer craters with a surrounding erythema. Examination of the lungs revealed no abnormal breath sounds, rales, or rubs. Chickenpox was diagnosed and the patient treated symptomatically.

The white blood cell counts were 8,300, 10,000, and 5,600 per cu mm, with 66, 72, and 70 percent neutrophils, respectively. No eosinophilia was noted. Urinalysis, throat culture, blood cultures, cold agglutination tests, serologic tests for

From William Beaumont Army Hospital, Fort Bliss, Texas.

Q fever, syphilis, and psittacosis, and electrocardiograms were negative. Sputum was never produced. A portable chest roentgenogram on admission revealed multiple bilateral nodular pulmonary infiltrations (fig. 1). Repeated films revealed slow clearing until 12 March when the roentgenogram was essentially normal.

On 10 February at 0200 hours, 12 hours after admission, the patient became unresponsive. He was cyanotic, with temperature of 105.8° F, pulse 160, respiration rate 48, and blood pressure 105/50 mm Hg. He was treated with

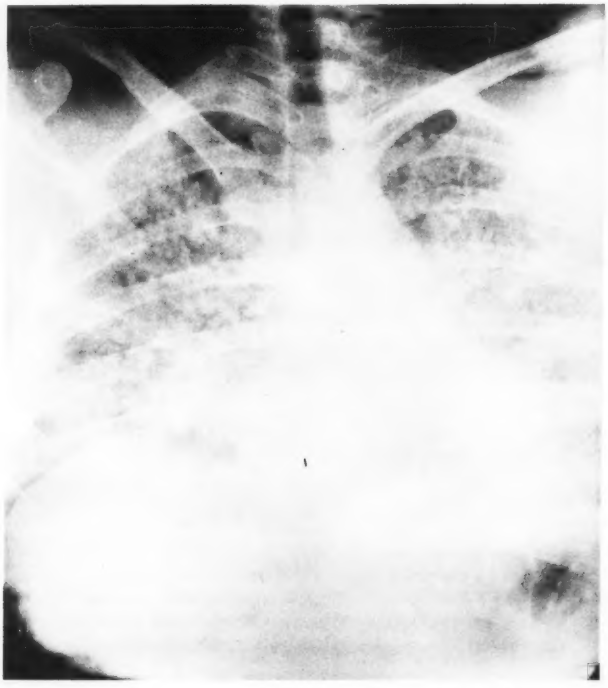

Figure 1. Portable chest roentgenogram, 10 February 1959, 12 hours after admission, revealing multiple nodular pulmonary infiltrations.

sponging, aspirin, intravenous fluids, oxygen, penicillin, and chloramphenicol. Five hours later, maintained in an oxygen tent with cold towels over his abdomen, he still was critically ill, dyspneic, cyanotic, and disoriented. His temperature was 103.8° F; pulse, 112; respirations, 36; and blood pressure, 118/70 mm Hg. He had occasional unproductive cough. A tentative diagnosis of chickenpox pneumonia was made. Because the patient's condition appeared critical, steroid therapy was thought to be indicated. Antibiotic therapy was continued because bacterial pneumonia could not be ruled out. Beginning at 0900 hours on the

same day, therapy with intravenous hydrocortisone was begun, and 300 mg was given in the ensuing 24 hours. The patient also received 60 million units of penicillin and 4 grams of chloramphenicol. At 1700 hours, 8 hours after the hydrocortisone and high dosage of antibiotics were begun, he had improved remarkably. His temperature was 99°; his pulse, 90; and his respirations, 24. He was no longer cyanotic, dyspneic, or disoriented. At 0800 hours on 11 February, he was hungry and no longer required oxygen. In the next 4 days he received prednisone in daily dosages of 80, 80, 40, and 40 mg. Penicillin and chloramphenicol were continued for one week at moderate dosage. Convalescence was uneventful. The skin lesions healed with a minimum of secondary infection.

DISCUSSION

The diagnosis of chickenpox pneumonia is a presumptive one based on clinical findings.[1,24] In association with the typical rash of chickenpox there is an acute onset of dyspnea, cyanosis, and cough. Sputum is usually produced and may be blood tinged. The temperature is high, the pulse fast, and the respiration is rapid and shallow. Physical examination reveals a paucity of lung findings. The chest roentgenogram reveals multiple bilateral nodular pulmonary infiltrations which clear slowly. The white blood count is 4,000 to 15,000 cells per cu mm with less than 80 percent neutrophils. The sputum and blood cultures are negative. The patient is critically ill for 1 to 7 days, with rapid clinical recovery.

Apparently antibiotics do not affect the virus of chickenpox.[9,15] The status of steroid therapy in the treatment of chickenpox pneumonia is uncertain. Patients are described as becoming afebrile within 24 hours after receiving hydrocortisone[17] or prednisolone.[24] The patient described by Rosecan, Baumgarten and Charles[13] was difficult to evaluate because of the shock, congestive failure, and pulmonary embolism which complicated the course. Our patient had marked clinical improvement after receiving hydrocortisone. In the 4 patients with chickenpox pneumonia who were treated with steroids, including the one reported here, other forms of treatment such as oxygen, fluids, antibiotics, and salicylates were used. Furthermore, the clinical course usually ends abruptly. Therefore, the effectiveness of steroid therapy in these cases cannot be determined. Prompt clinical improvement following the use of steroids suggests that these agents may have been beneficial. There was no evidence of harmful effect. Further trial of steroids in the treatment of chickenpox pneumonia appears justifiable.

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Military Medical News

AEROSPACE MEDICAL CENTER ESTABLISHED

Formal military ceremonies marked the establishment on 1 October of the U.S. Air Force Aerospace Medical Center, with headquarters at Brooks Air Force Base, Texas. Facing the color guard, presenting the flag of the School of Aviation Medicine, are Major Otis O. Benson, Jr., USAF, MC, commander of the new Center, Major General Carl A. Brandt, USAF, Vice Commander, Air Training Command, Brigadier General M. S. White, USAF, MC, surgeon,

Training Command, and Brigadier General James G. Moore, USAF, MC, commander of the U.S. Air Force Hospital, Lackland Air Force Base, Texas.

The Aerospace Medical Center, a part of the Air Training Command, includes the School of Aviation Medicine, which recently moved to new facilities at Brooks Air Force Base, a branch at Gunter Air Force Base, Alabama, and the U.S. Air Force Hospital and Air Force Epidemiology Laboratory at Lackland Air Force Base. In addition to his duties as commander of the Center, General Benson will continue as commandant of the School.

The Center accomplishes advanced space age research, trains flight surgeons, nurses and aeromedical technicians, and provides clinical medicine facilities for Air Force personnel.

Officers Certified by Specialty Boards

The surgeons general of the military medical services have announced that the following regular Medical Corps officers have been certified.

American Board of Ophthalmology
Peabody, Sherman M., Capt., USN

American Board of Preventive Medicine

Aviation Medicine
Anderson, George R., Capt., USAF
Cutler, Kay R., Maj., USAF

Occupational Medicine
Rosenwinkel, N. E., Lt. Comdr., USN.

HISTORIC MEDICAL INSTRUMENTS. The Armed Forces Institute of Pathology Medical Museum, established during the Civil War by Brigadier General William A. Hammond, Surgeon General of the Army, will celebrate its 100th anniversary in 1961 during the Civil War Centennial. In connection with this celebration, museum officials are seeking military medical material to expand and complete many of its historical exhibits. Among the items particularly desired are historical medical instruments of Confederate Army origin. Microscopes, particularly those from 1920 to the present, are also desired.

Official Decorations

The following awards were recently announced by the Departments of the Army, Navy and Air Force.

Legion of Merit

Victor A. Byrnes, Brig. Gen., USAF, MC

John R. Copenhaver, Brig. Gen., USAF, MC

Elbert DeCoursey, Maj. Gen., MC, USA*

Loyd E. Griffis, Brig. Gen., USAF, MC

Navy and Marine Corps Medal

Albert R. Behnke, Jr., Capt., MC, USN

Army Commendation Ribbon with Metal Pendant

Oscar Fesenfield, Lt. Col., MC, USAR*

Clifford C. Lardinois, Sr., Capt., MC, USA

Charles H. Segars, Capt., MSC, USAR

Robert B. Skinner, Col., MC, USA*

Ernest F. Rezendes, Capt., MSC, USA

James T. Richards, Col., MSC, USA

Air Force Commendation Medal

Charles H. Bramlitt, Col., USAF, MC

Charles M. Sanders, Capt., USAF, MSC

*First oak leaf cluster.

DR. BERRY IS SPEAKER

Dr. Frank B. Berry, M.D., Assistant Secretary of Defense (Health and Medical), gave an address at the recent annual meeting of the Kentucky State Medical Association in Louisville. Speaking at the president's luncheon, Dr. Berry described the functions and activities of his office in Washington.

CHENAULT RETIRES

Captain Oran W. Chenault, MC, USN, assistant chief for aviation medicine, Bureau of Medicine and Surgery, for the past two years, retired 1 October after 29 years of naval service. Entering the Navy shortly after his graduation from the University of Arkansas School of Medicine in 1930, he was stationed at the Naval Hospital in Pearl Harbor at the time of the Japanese attack in December 1941, and was interned there for 13 months. He was designated as a flight surgeon in May 1942. A fellow of the American Academy of Ophthalmology and Otolaryngology, Captain Chenault is president-elect of the Aerospace Medical Association.

ARMY OFFICERS HONORED

Lieutenant Colonels Carl W. Hughes and Arthur Cohen, MC, USA, and Majors Eleanor H. Faulk and Blanche M. Stewart, NC, USA, members of the Army surgical team which operated on the prime minister of Thailand, Field Marshal Sarit Thanarat, earlier this year, were recently awarded high decorations by the Thai government.

Colonel Hughes, chief of the department of surgery, Tripler Army Hospital, and Colonel Cohen, chief of general surgery services, Walter Reed Army Hospital, were named as Commanders of the Most Noble Order of the Crown of Thailand. Major Faulk, nurse anesthetist, and Major Stewart, operating room nurse, both of whom are stationed at Tripler Army Hospital, were awarded the Most Exalted Order of the White Elephant.

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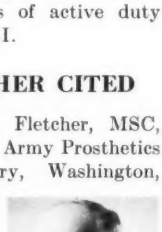
KIDDER RECEIVES STAR

Brigadier General James H. Kidder, MC, USAR, who has served as special assistant to the Army surgeon general for reserve affairs since 1955, was promoted to his present rank in September. Dean of Fordham University's College of Pharmacy from 1932 to 1955, when he became Dean Emeritus, General Kidder is also professor of clinical surgery at New York Medical College, and serves as a consultant to two other New York City hospitals. Commissioned in the U.S. Army Reserve in 1928, following his graduation from Cornell University Medical College, he has 31 years of continuous service, including five years of active duty during World War II.

COL. FLETCHER CITED

Colonel Maurice J. Fletcher, MSC, USA, director of the Army Prosthetics Research Laboratory, Washington, D.C., will receive the Holley Medal, given for "an act of engineering genius resulting in public benefit," at the annual meeting of the American Society of Mechanical Engineers in Atlantic City, on 30 November, for his work in designing artificial limbs. One of the devices for which Colonel Fletcher is cited is a lock for the artificial hand which operates without a control knob, enabling the amputee to open and close his hand very rapidly without having to use his other hand or pressure on another object. Another enables amputees to exert any force necessary to grasp an object with their artificial hands, with no more pain or fatigue than in a normal hand. He also has designed a special spring which provides a "breakaway" to protect the amputee whose arm might be locked to a moving object such as a bus rail.



SHONE GIVEN NEW POST

Captain Lloyd B. Shone, MC, USN, a specialist in occupational medicine who holds both medical and dental degrees, has been appointed as director of the preventive medicine division, Bureau of Medicine and Surgery. He succeeds Captain Howard K. Sessions, MC, USN, who retired from the Navy after more than 28 years of service, on 1 September, to head the preventable diseases service of the Georgia State Health Department, in Atlanta.

Captain Shone served in the Navy as a medical corpsman in World War I, and a medical officer in the Pacific during World War II. In 1933, he was commissioned in the Navy Medical Corps following his graduation from Creighton University School of Medicine. He also holds an advanced degree from the Harvard School of Public Health. Captain Shone was assigned to the preventive medicine division of the Bureau of Medicine and Surgery in 1954.

ASTRONAUT SUIT CHOSEN

The Navy's newest aluminized full pressure omni-environmental suit has been chosen for use by the astronauts who will fly in Project Mercury. This suit was developed at the Air Crew Equipment Laboratory, Philadelphia, by naval aviation medicine personnel.

Progress Notes

Major General **Thomas J. Hartford,** MC, USA, deputy surgeon general of the Army, recently received his second star . . . Captain **Ralph D. Berry,** MC, USN, attended the Second Brazilian Congress on Military Medicine, 24–31 August, in Port Alegre, as a representative of the Office of the Assistant Secretary of Defense (Health and Medical) and the Navy Medical Department . . . Lieutenant Colonel **Ingalls H. Simmons,** MC, USA, chief of the department of preventive medicine at the Army Medical Service School, left Fort Sam Houston in August to become chief of preventive medicine for the Communications Zone in Orleans, France . . . Captain **Robert P. Irons,** DC, USN, recently retired after nearly 32 years of naval service.

Captain **Edward J. Holubek,** DC, USN, has assumed command of the U.S. Naval Dental Clinic, U.S. Naval Base, Brooklyn, New York, succeeding Captain **Francis W. Lepeska,** DC, USN, who retired in July after almost 35 years of active service. Captain Holubek was senior dental officer at the U.S. Naval Station, Newport, Rhode Island . . . Colonel **Laurence M. Hursh,** MC, USA, chief of the medical research division, Army Medical Research and Development Command, recently received the silver eagles of his new rank in a ceremony in the Army surgeon general's office . . . Captain **Horace D. Warden,** MC, USN, stationed at the U.S. Naval Hospital, Philadelphia, Pennsylvania, was recently elected a fellow in the American College of Chest Physicians.

Captain **Shakeeb Ede,** MC, USN, chief of surgery at the U.S. Naval Hospital, Great Lakes, Illinois, has been appointed assistant clinical professor of surgery at Marquette University School of Medicine. He is the first Naval Medical Corps officer on active duty to join Marquette's medical faculty . . . Colonel **Edwin H. Smith, Jr.,** DC, USA, was recently promoted to his current rank. He is chief of the career management branch in the dental division, office of the Army surgeon general . . . Captain **Albert E. Morris,** MC, USN, stationed at the U.S. Naval Air Station, Quonset Point, Rhode Island, has been elected as a fellow in the American College of Preventive Medicine.

Captain **William M. Snowden,** MC, USN, deputy director of the Aviation Medicine Operations Division, departed the Bureau of Medicine and Surgery in August to assume his new duties in San Diego, on the staff of the Commander, Naval Air, Pacific. He has been succeeded by Captain **Merrill H. Goodwin,** MC, USN, who was assigned at the Naval Air Station, Quonset Point, Rhode Island . . . Brigadier General **George M. Powell,** MC, USA, commanding general of Madigan Army Hospital, was promoted to his present rank in July . . . Lieutenant Commander **Lynne T. Greene,** MC, USN, was recently elected as a fellow in the American College of Anesthesiologists.

Colonel **Nicholas F. Atria,** USAF, MC, commanding officer of the 18th Tactical Hospital on Okinawa, retired 31 July after 22 years of service . . . Captain **Joseph J. Timmes,** MC, USN, stationed at the U.S. Naval Hospital, St. Albans, New York, has been elected to associate membership in the American Association for Thoracic Surgery . . . Colonel **Ronald F. Kirk,** USAF, MC, left the Air Force in June, after 30 years of service. Prior to his retirement, he was deputy surgeon, Headquarters, Alaskan Air Command, Elmendorf Air Force Base.

Colonel **Donald L. Ferris,** USAF, MC, deputy surgeon at MATS head-

quarters, Scott Air Force Base, Illinois, has been named commanding officer of the hospital at Castle Air Force Base, California . . . Colonel **Rogers Hederich,** USAF, MC, replaced Lieutenant Colonel **Summer A. Cheeseman,** USAF, MC, as commanding officer of the 4083d USAF Hospital at Goose Air Force Base, Labrorador, when the latter was transferred to Whiteman Air Force Base, Missouri . . . Colonel **Clifford P. Michael,** USAF, MC, hospital commander at Bergstrom Air Force Base, Texas, has been named staff surgeon for the 14th Air Force, Robins Air Force Base, Georgia, for the second time. He held the same position in 1949.

Rear Admiral **James L. Holland,** MC, USN, senior medical officer, staff of the Commander, Naval Air, Pacific, has been named commanding officer of the U.S. Naval Aviation Medical Center, Pensacola, Florida . . . Colonel **Pierre O. Evans,** DC, USA, formerly assigned to the Seine Area Command, Paris, France, recently assumed his new duties as chief of the prosthodontics section, Dental Service, Fitzsimons Army Hospital, Denver . . . Captain **Joseph L. Yon,** MC, USN, is the new executive officer and chief of surgery at the U.S. Naval Hospital, Camp Lejeune, North Carolina.

Fitzsimons Army Hospital's chief of psychiatry, Colonel **Richard F. Mulholland,** MC, USA, was promoted to his present rank in August . . . Captain **Raymond A. Lowry,** DC, USN, fleet and force dental officer, Commander Service Force, U.S. Pacific Fleet, retired recently after more than 30 years of active service . . . Captain **Anthony K. Kaires,** DC, USN, senior dental officer at the U.S. Naval Station, Sangley Point, P.I., presented a paper on "Occlusal Equilibration", at the fifth anniversary celebration of the Dental Service of the Philippine Armed Forces in Manila.

Colonel **William G. Thalmann, Jr.,** MC, USA, chief of professional services, Patterson Army Hospital, Fort Monmouth, New Jersey, was recently promoted to his present rank . . . Captain **Robert A. Colby** and Commander **Henry H. Scofield, Jr.,** DC, USN, have been elected as president-elect and vice president of the American Academy of Oral Pathology for 1959–1960 . . . Lieutenant Colonel **Kenneth L. Marlof,** USAF, MC, is the new director of medical services for the 802d Medical Group, Schilling Air Force Base, Kansas . . . Captain **Robert K. Moxon,** MC, USN, was recently elected to fellowship in the American College of Physicians. He is stationed with the U.S. Naval Medical Unit, Tripler Army Hospital, Hawaii.

Major General **Elbert DeCoursey,** MC, USA, commandant of the Army Medical Service School, Brooke Army Medical Center, retired 30 September, after 31 years of service. General DeCoursey was awarded an honorary degree of doctor of laws by Baylor University at summer graduation ceremonies . . . Captain **Benjamin W. Oesterling,** DC, USN, senior dental officer, U.S. Marine Corps Air Station, El Toro, California, presented a scientific paper at the Orange County Dental Society meeting in September at Anaheim, California . . . Colonel **John S. Zelenik,** MC, USA, is the new chief of obstetrics and gynecology at Fitzsimons Army Hospital, succeeding Colonel **James H. Smith,** MC, USA. Colonel Zelenik previously was consultant to the theater surgeon at Camp Zama, Japan.

Colonel **Aubrey L. Jennings,** USAF, MC, surgeon of Headquarters Command, USAF, for the past five years, and hospital commander at Andrews Air Force Base, Maryland, became director of professional services in the office of the Air Force surgeon general on 14 August. He replaces

Brigadier General **Victor A. Byrnes,** USAF, MC, who retired 30 September after 30 years of military service to become director of medical education at Mound Park Hospital, St. Petersburg, Florida . . . Lieutenant Colonel **Robert D. Pillsbury,** MC, USA, is the new head of the professional training branch in the office of the Army surgeon general, coming to Washington from Fort Leavenworth, Kansas, where he was a student at the Command and General Staff College . . . Commander **Arthur J. Draper,** MC, USN, stationed at the U.S. Naval Hospital, San Diego, California, has been elected an associate fellow of the American College of Physicians.

Captain **Walton L. Jones,** MC, USN, head of the aviation medical equipment branch, Bureau of Medicine and Surgery, represented the Navy Medical Department at a conference at the U.S. Naval Air Special Weapons Facility, Albuquerque, New Mexico, on protection from flash blindness resulting from atomic explosions . . . Captain **John H. Tenery,** MC, USA, chief of plastic surgery at Brooke Army Hospital, recently received his silver bars in a ceremony at Fort Sam Houston . . . Captain **George V. Irons,** USAF MC, chief of medical services, USAF Hospital, Donaldson Air Force Base, Greenville, South Carolina, participated in a symposium on pulmonary alveolar proteinosis at the 24th annual meeting of the Piedmont Post-Graduate Clinical Assembly, sponsored by the South Carolina chapter of the American Academy of General Practice at Clemson, 16–17 September.

The U.S. Naval Hospital, Great Lakes, Illinois, has been approved for residency training in internal medicine for three years by the Residency Review Committee. Residents will train under Captain **Paul T. Moore,** MC, USN, chief of medicine . . . Colonel **Laurene A. Potter,** MC, USA, has been named assistant commandant of the Army Medical Service School, Brooke Army Medical Center, replacing Colonel **Raymond E. Duke,** MC, USA, who has been assigned as Seventh Corps surgeon in Germany. Colonel Potter has been serving as director of the department of military sciences and chief of the academic division at the School . . . Captain **Theodore A. Lesney,** DC, USN, has relieved Captain **William B. Johnson, Jr.,** DC, USN, as chief of dental service at Great Lakes, Illinois. Captain Johnson has reported as chief of dental service to the U.S. Naval Hospital, Camp Pendleton, California.

Captain **Leslie D. Ekvall,** MC, USN, executive officer, U.S. Naval Hospital, Portsmouth, Virginia, has been named as commanding officer of the U.S. Naval Hospital, Key West, Florida, succeeding Captain **Harold J. Cokely,** MC, USN, who will head the U.S. Naval Hospital, St. Albans, New York. Captain Ekvall will be replaced by Captain **John L. Hatch,** MC, USN, executive officer and chief of radiology at the U.S. Naval Hospital, Camp Lejeune, North Carolina . . . Colonel **William M. Ream,** DC, USA, formerly chief of the Sixth U.S. Army Dental Laboratory, Alameda, California, in July became commanding officer of the Central Dental Laboratory, Brooke Army Medical Center.

Captain **Albert S. Hyman,** MC, USNR (Ret.), was elected president of the American College of Sports Medicine at its sixth annual meeting in June. Dr. Hyman is associate clinical professor of medicine, New York Medical College . . . New PRO's in the offices of the Air Force and Army surgeons general are Lieutenant Colonel **Joseph W. Lynch,** USAF, succeeding Lieutenant Colonel **Raymond L. Towne,** USAF; and Lieutenant Colonel **Francis C. Nelson,** MSC, USA, succeeding Major **William V. Davis,** MSC, USA, who is attending Army

Medical Service School, Brooke Army Medical Center . . . Captain **Luther G. Bell,** MC, USN, executive officer and director of professional services, U.S. Naval Hospital, Chelsea, Massachusetts, succeeded Captain **Jerry T. Miser,** MC, USN, as commanding officer of the U.S. Naval Hospital, Corpus Christi, Texas, when the latter was assigned to the Marine Corps Recruit Depot, San Diego, California.

ACCREDITED HOSPITALS

The Joint Commission on Accreditation of Hospitals, composed of representatives of the American College of Physicians, American College of Surgeons, American Medical Association, and the American Hospital Association, has inspected and accredited the U.S. Army Hospitals at the following locations:

Continental United States

Aberdeen Proving Ground, Md.
Camp Leroy Johnson, La.
Carlisle Barracks, Pa.
Fort Benjamin Harrison, Ind.
Fort Benning, Ga.
Fort Bragg, N.C.
Fort Campbell, Ky.
Fort Carson, Colo.
Fort Devens, Mass.
Fort Dix, N.J.
Fort Eustis, Va.
Fort George G. Meade, Md.
Fort Gordon, Ga.
Fort Hood, Tex.
Fort Huachuca, Ariz.
Fort Jackson, S.C.
Fort Jay, N.Y.
Fort Knox, Ky.
Fort Lawton, Wash.
Fort Leavenworth, Kans.
Fort Lee, Va.
Fort Leonard Wood, Mo.
Fort McClellan, Ala.
Fort McPherson, Ga.
Fort Monmouth, N.J.
Fort Monroe, Va.
Fort Ord, Calif.
Fort Riley, Kans.
Fort Rucker, Ala.
Fort Sill, Okla.
Fort Stewart, Ga.
Sandia Base, N. Mex.
West Point, N.Y.
Brooke Army Hospital, Fort Sam Houston, Tex.
DeWitt Army Hospital, Fort Belvoir, Va.
Fitzsimons Army Hospital, Denver, Colo.
Letterman Army Hospital, San Francisco, Calif.
Madigan Army Hospital, Fort Lewis, Wash.
Walter Reed Army Hospital, Washington, D.C.
William Beaumont Army Hospital, Fort Bliss, Tex.
Valley Forge Army Hospital, Phoenixville, Pa.

Overseas Areas

Bad Cannstadt Army Hospital, Germany
Frankfurt Army Hospital, Germany
Landstuhl Army Hospital, Germany
Neubrucke Army Hospital, Germany
Rodriguez U.S. Army Hospital, P.R.
Ryukyu U.S. Army Hospital, Okinawa
Tripler U.S. Army Hospital, Hawaii

PARACHUTE DOCTORS

Only physicians who wear the wings of a paratrooper in addition to Medical Corps insignia, are eligible for one of the Army's highest level "clubs." Its members fly, and jump, with the 82d and 101st Airborne Divisions, and include three medical officers stationed with the 8th Infantry Division in Germany. Membership now stands at 35, with 10 more prospective members in training. Paratroop physicians complete the full cycle of paratroop training and make at least four proficiency jumps a year, jumping each time their unit jumps.

This Is Your A.M.A.

THE COMMITTEE ON MEDICOLEGAL PROBLEMS, as its name implies, is devoted to the task of improving the day-to-day working relationships between two fine groups. Since its inception, the membership of the American Medical Association has been well aware of the mutual concerns of medicine and the law. At its 1849 meeting, in fact, the Association created a Committee on Forensic Medicine. A major step in setting up the machinery for handling the medicolegal interests of the A.M.A. was the creation, in 1922, of a Bureau of Legal Medicine and Legislation. This was merged into the Law Department (now the Law Division) in 1954. Even during the existence of the Bureau, when particular problems came along, the Board of Trustees would appoint special committees to consider them. There were, for example, committees to study the utilization of blood tests in disputed paternity cases; the use of chemical tests to determine alcoholic intoxication; and the relationships between medicine and the law, particularly so far as the medicolegal investigation of death is concerned. In 1950 all these committees, some relatively inactive at that time, were merged by the creation of the Committee on Medicolegal Problems.

Since its organization, the committee has designated certain subcommittees to do preliminary work in investigating various problems, and in each instance a member of the committee has acted as chairman of the subcommittee. There are subcommittees on tests for alcoholic intoxication, on medicolegal aspects of blood transfusions, on blood tests in disputed paternity cases, on professional liability, on teaching of legal medicine and medical jurisprudence in medical schools, on status of the coroner system and the medical examiner system in the United States, as well as others. Numerous reports relating to the subjects represented by these subcommittees have been prepared. A partial listing of some of these reports, which have been approved by the committee as a whole and are available to the profession on request, follows: A Suggested Course in Legal Medicine for Medical Schools; Test Your A.Q. (Alcohol Quotient); Medicolegal Aspects of Blood Transfusions; Medicolegal Application of Blood Grouping Tests; Medicolegal Application of Blood Grouping Tests (Supplemental Report); and Malpractice and the Physician.

The director of the A.M.A. Law Division is a member of the committee and one of the members of the Law Division staff acts as its executive secretary. Collaboration between the Committee and the Law Division is therefore very close. One project in which the two groups cooperated was a comprehensive survey on the problem of medical professional liability throughout the country. The results of this survey have been published in *The Journal of the American Medical Association* and have been the subject of discussion at numerous medical meetings. Another joint activity has been the preparation of a series of medicolegal films and the sponsoring of regional medicolegal symposiums. To date, four films have been prepared: The Medical Witness, demonstrating the right and wrong way to prepare for and give medical testimony; The Doctor Defendant, portraying the activities of a medical review committee; The Man Who Didn't Walk, a study of the problem of traumatic neurosis; and A Matter of Fact, showing the benefits of using properly trained persons in medicolegal investigations. A fifth film is presently under study. In the field of "live drama" rather than film, a script was prepared for a mock-trial demonstration of a drunken-driving

From the Council on National Defense of the American Medical Association. The views and opinions expressed are not necessarily those of the Department of Defense.—*Editor*

case, which was presented to physician-lawyer audiences in more than half a dozen areas around the country. Regional medicolegal symposiums have been held in the years 1955, 1957, and 1959 in locations ranging from Washington to Denver and from Salt Lake City to Atlanta. Some of the subjects covered at these meetings were chemical tests for intoxication, trauma and cancer, impartial medical testimony, traumatic neurosis, narcotics, interprofessional codes, and malpractice.

The present personnel of the committee consists of outstanding representatives in the fields of forensic pathology, forensic psychiatry, forensic toxicology and hematology, medicolegal education, and law. Currently being studied by these men are the improvement of the coroner and medical examiner systems for making medicolegal investigations, the furtherance of the use of blood grouping tests in paternity cases, the formation of subcommittees to study some of the more hazardous fields of medical practice such as long-term damages from x-ray irradiation, sensitivity to antibiotic agents, cardiac resuscitation, use of tetanus antitoxin, and others, and the preparation of more medical films and medicolegal exhibits.

The films previously mentioned as being completed are available for use by medical groups. They may be obtained by writing to the Film Library, American Medical Association, 535 North Dearborn Street, Chicago 10, Illinois. Pamphlets and information may be obtained by writing to the Committee on Medicolegal Problems at the same address.

Monthly Message—continued from page ii

As to the third axiom, the ability of man to vary his behavior, it is indeed fortunate that this is so. Today with two conflicting ideologies—(1) respect for the individual, and (2) the authoritarian state—we of the free world must exploit the ability to *change* and *vary* our behavior not only to *meet* the challenges of the authoritarian state in which the individual is but a small cog, but rather to *lead* forward and discredit this philosophy.

Frank B. Berry

FRANK B. BERRY, M.D.
Assistant Secretary of Defense
(Health and Medical)

HAMLIN, HELEN MARTHA, First Lieutenant, AFRes, NC, of Pine City, Minnesota; assigned to 3973d USAF Hospital, San Pablo Air Base, Spain; graduated in 1950 from Hamline University School of Nursing, St. Paul, Minnesota; appointed a second lieutenant in the Air Force Reserve 6 March 1952; reported for active duty 16 May 1952; died 26 August 1959, aged 30, at the 3973d USAF Hospital, as a result of an automobile accident.

HUNT, OSCAR LEWIS, First Lieutenant, MSC, USAR, of Chester, Pennsylvania; assigned to the 595th Medical Clearing Company, Karlsruhe, Germany; graduated in 1956 from Morgan State College, Baltimore, Maryland; appointed a second lieutenant in the Army of the United States 4 June 1956; reported for active duty 28 February 1957; died 14 September 1959, aged 25, near Saverne, France, in an automobile accident.

KIRBY, DUNNE WILSON, Captain, MC, USN, of Philadelphia, Pennsylvania; assigned to U.S. Naval Hospital, St. Albans, New York; graduated in 1928 from Hahnemann Medical College and Hospital of Philadelphia; appointed a lieutenant commander in the United States Naval Reserve 16 April 1942; reported for active duty 20 April 1942; commissioned a commander in the United States Navy 5 July 1946; died 7 September 1959, aged 57, at U.S. Naval Hospital, St. Albans, of intrapulmonary hemorrhage.

MATTHEWS, NORMAN CALVIN, Captain, DC, USAR, of Nashville, Tennessee; assigned to U.S. Army Hospital, Fort Sill, Oklahoma; graduated in 1956 from Meharry Medical College School of Dentistry, Nashville; appointed a first lieutenant in the Army of the United States 6 June 1956; reported for active duty 3 July 1956; died 10 August 1959, aged 32, at Brooke Army Hospital, Fort Sam Houston, Texas, of pulmonary carcinoma.

RAINES, GEORGE NEELY, Captain, MC, USN, of Jackson, Mississippi; last assigned at the U.S. Naval Hospital, Bethesda, Maryland; graduated in 1931 from Northwestern University Medical School, Chicago, Illinois; commissioned a lieutenant (j.g.) in the United States Navy 26 June 1930; reported for active duty 26 June 1930; retired for physical disability 1 May 1959; died 16 September 1959, at the U.S. Naval Hospital, Bethesda, of bronchogenic carcinoma.

RING, DEAN MERRILL, Major, USAF, MC, of Cedar Rapids, Iowa; last assigned to the USAF Hospital, Chanute Air Force Base, Illinois; graduated in 1951 from State University of Iowa College of Medicine, Iowa City; served in enlisted status, United States Naval Reserve, 17 April 1944 to 10 February 1947; appointed an ensign in the United States Naval Reserve 11 February 1947; resigned 25 February 1949; appointed a second lieutenant in the Air Force Reserve 3 April 1950; reported for active duty 14 June 1950; released from active duty 10 September 1950; returned to active duty 2 July 1951; commissioned a first lieutenant in the United States Air Force 15 March 1953; retired for physical disability 17 June 1959; died 17 September 1959, aged 33, at the USAF Hospital, Chanute Air Force Base, of leukemia.

WAGNER, ROBERT LOWELL, Captain, MC, USN, of San Francisco, California; assigned to U.S. Naval Hospital, San Diego, California; graduated in 1935 from McGill University Faculty of Medicine, Montreal, Canada; appointed a lieutenant (j.g.) in the United States Naval Reserve 7 April 1938; reported for active duty 12 February 1941; commissioned a lieutenant in the United States Navy 5 July 1946; died 7 September 1959, aged 51, at U.S. Naval Hospital, San Diego, of aplastic anemia.

Book Reviews

MEDICAL DEPARTMENT OF THE UNITED STATES ARMY. SURGERY IN WORLD WAR II. Neurosurgery, Volume I. Editor-in-Chief, Col. *John Boyd Coates, Jr.*, MC, USA. Editors for Neurosurgery, *R. Glen Spurling*, M.D., and *Barnes Woodhall*, M.D. Associate Editor, *Elizabeth M. McFetridge*, M.A. 466 pages; illustrated. Historical Unit, Army Medical Service, Office of the Surgeon General, Department of the Army, Washington 25, D.C., 1958. Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Price $5.

This first of two volumes on neurosurgery in World War II begins with details of the administrative development of neurosurgery within the Army Medical Service, and with the evolution of professional policies. The major portion, however, is given over to the management of head injuries in all its facets, from combat problems to elective rehabilitative surgery. The volume to follow will deal with injuries of the spine and peripheral nerves, and with the problem of the ruptured intervertebral disc. The section on administration traces the growth of the neurosurgical specialty in the Army from its beginning at Walter Reed Hospital in May 1942 to its expansion by January 1945 into nineteen neurological centers in the zone of interior with a total bed capacity of 21,900. Plans and policies stressed the desirability of having neurologists and neurosurgeons work in close association, particularly under conditions of combat. Because the neurosurgical centers, however, took nearly all the certified neurosurgeons and neurosurgical residents available for service, training centers were set up at the University of Illinois, at Columbia, and later at the University of Pennsylvania. More than 200 officers were given indoctrination into neurosurgical technics. Early in the war, especially in the oversea theaters, the most experienced neurosurgeons were assigned to neurosurgical centers in general hospitals, and not to combat units. In the European theater this was a practical plan for, by 1944 when air evacuation of patients from France was the rule, the time elapsed between injury and arrival in a general hospital in England was only 6 to 12 hours. Later, neurosurgical teams attached to auxiliary surgical groups in evacuation and field hospitals operated on the majority of the injured.

Important statistics are interspersed throughout the text. For instance, in 1,000 cases of autopsy performed on the battlefield dead, it was found that head injury was the cause of death, or contributed to it, in 40 percent of the cases. About 10 percent of seriously wounded patients had neurosurgical problems. The overall mortality in penetrating wounds of the head was about 30 percent. The operative mortality was 10 to 15 percent, being fairly consistent in the various centers. In transventricular wounds the operative mortality was 30 to 40 percent. In World War I the operative mortality had been 20 to 30 percent (Cushing) and the mortality with transventricular wounds 57 percent (Horrax). The presence of neurosurgeons with good equipment in forward areas, rapid evacuation, modern methods of resuscitation, and antibiotic therapy all contributed to this improvement but, probably as much as anything else, the good results were due to the application of surgical principles of bold débridement, redébridement, and even late débridement of infected, neglected wounds. The volume concludes with a chapter on clinicopathologic correlations based on a

study of 24 patients who survived from 30 minutes to 10 days after wounding. The sequence of changes is as follows: Within a few hours after the initial laceration and hemorrhage a spreading thrombosis and necrosis occur, which is then followed by infiltration of white cells and activity of glia by 18 hours. After the second day demyelinization was apparent; after the third day gitter cells made their appearance; after the fourth day, capillary proliferation was seen. Multiple brain lesions were the rule, 18 of the 24 patients also having ventricular wounds. It is pointed out, however, that, except for obvious injuries involving the brain stem, one cannot judge the outcome of a case solely on the distribution of the apparent lesions. The intangibles are too great, and the decision regarding operability of any one patient will ultimately depend on the interplay between one's clinical estimate and the realization that many cases are waiting to be done. There is an appendix with practical points on the management of various types of injuries. The volume stands as a tribute to those who took part in shaping it.

MAJ. HAROLD ROSEGAY, MC, USA

TOTAL SURGICAL MANAGEMENT, by *James D. Hardy*, M.S., M.D., F.A.C.S. Modern Surgical Monographs. Editor-in-chief, *I. S. Ravdin*, M.D.: Consulting editor, *Richard H. Orr*, M.D. 292 pages; illustrated. Grune & Stratton, Inc., New York, N.Y., 1959. Price $9.50.

This is a rather unique book written by the professor of surgery at the new and vigorous medical school of the University of Mississippi. In his preface the author states that the book is intended primarily for the general surgical practitioner. However, it would seem to be an ideal book for the surgical intern and resident because it contains information not usually found in textbooks but handed down by word of mouth. It discusses such questions as how to talk to a patient and his family, what factors to consider in judging whether a patient can withstand the contemplated surgery, what are normal values, how to calculate fluid and electrolyte requirements, how to perform venipuncture in difficult cases, how much is the probable blood loss at different operations, the cause and treatment of shock, how to write preoperative and postoperative orders and the rational behind the orders, when and how to carry out various diagnostic and therapeutic procedures, how to examine and diagnose the acute abdomen, how to set up and care for such apparatus as the Sengstaken tube, Levin tube, or duodenal fistula suction, how to give and withdraw cortisone after surgery, and many other very practical points that are hard to find discussed in the detailed written form. These are questions that a young surgeon will frequently want to ask the professor when he is suddenly faced with the problem. This book is highly recommended for all hospital medical libraries, particularly those hospitals which train interns and residents.

LT. COL. ROBERT M. HARDAWAY, MC, USA

PROGRESS IN PSYCHOTHERAPY, Volume IV, Social Psychotherapy, edited by *Jules M. Masserman*, M.D., and *J. L. Moreno*, M.D. 561 pages. Grune & Stratton, Inc., New York, N.Y. 1959. Price $8.75.

This annual review of psychotherapy, the fourth in a series, presents some of the best papers on the subject published during the preceding year, as well as some special articles by the editors themselves. Included are a number of articles on psychotherapy in various parts of the world. Although some of these might seem a little dull to the average reader if his interests were not in that area, they constitute a useful addition to the whole subject of psychotherapy.

The book is valuable, summarizing and presenting as it does the various opinions of numerous authors in psychotherapy, a specialty which is still far from being a science and about which many are still inclined to be dogmatic. It is not a book that one should attempt to read from cover to cover, but rather one from which to select an occasional article from time to time, depending on one's interest at the moment. It is highly recommended to all those interested in the complex problem of psychotherapy.

LT. COL. JAY F. TUTTLE, MC, USA

STRONG AND ELWYN'S HUMAN NEUROANATOMY, by *Raymond C. Truex*. 4th edition. 511 pages; illustrated. Williams & Wilkins Co., Baltimore, Md., 1959. Price $10.

Revision of this standard textbook of neuroanatomy has been well done. The neurohistologic portions continue to be a classic. Most of the fine drawings and illustrations of previous editions are preserved in the present one. Major changes in a chapter on fiber tracts of the spinal cord plus the addition of colored diagrams of nervous pathways has produced a popular functional approach. The material given seems primarily designed for medical students, who need a solid base of neuroanatomic knowledge. There is little reflection of current research on the limbic system even though the rhinencephalon and olfactory pathways achieve chapter status. The book should satisfy those who, in addition to a fundamental textbook, desire a fairly comprehensive knowledge of the structure of the nervous system.

LT. COL. ARTHUR J. LEVEN, MC, USA

PSYCHOLOGY OF PERSONALITY, edited by *J. L. McCary*, Ph. D., with six contributors. 383 pages. Grove Press Inc., New York, N.Y., 1959. Price $1.95.

This book is an outgrowth of the annual lecture series in psychology held at the University of Houston. The series included a symposium in personality by six leaders in the field—Leopold Bellak, Raymond B. Cattell, George S. Klein, David C. McClelland, Margaret Mead, and Nevitt Sanford. Each author has presented his position using a terminology and organization best suited to his own theoretical approach. The chapters are concise and well organized. The material presented is of superior quality. The points of view presented by the different authors are set forth in a lucid and interesting style and the uniqueness of each of the theories presented can be easily grasped. Each section of material is systematically set forth with appropriate topic headings, and the charts and graphs are given in a style which is clear and easy to interpret. There is an ample bibliography. This volume will appeal to a rather limited group of readers, but can be well recommended as a basic reference for psychologists. It will probably serve as excellent background material for psychiatrists and social workers.

LT. COL. WENDELL R. WILKIN, MSC, USA

INDUSTRIAL CARCINOGENS, by *R. E. Eckardt*, M.D., Ph. D., F.A.C.P. 164 pages; illustrated. Grune & Stratton, Inc., New York, N.Y., 1959. Price $6.50.

This small volume provides an excellent introduction to the subject of industrial carcinogens. In six chapters, the author discusses the historical aspects of occupational cancer, experimental carcinogenesis, occupational cancers of the various organ systems, protective occupational health programs, medicolegal considerations and, lastly, his "look into the future." Without minimizing the importance of laboratory findings in the field of experimental carcinogenesis, it is pointed out that knowledge of occupational cancer has come from the observa-

tions made by physicians on human beings suffering from cancer. Of the reported cases of occupational cancer, approximately 75 percent have been of the skin; 15 percent of the bladder; and the remaining 10 percent have involved bone, lung, sinuses, and larynx. Reported agents and processes associated with industrial cancer include coal tar, shale oil, arsenic, ionizing radiation, ultraviolet radiation, aromatic amines, radium, chromate production, nickel refining, saltpeter mining, asbestos production and isopropyl alcohol manufacture. The chapters on industrial carcinogens and protective programs are practical and specific. Although this book concerns industrial cancers, one can learn much about the principles and practice of occupational medicine from it. The bibliography is up-to-date and satisfying. This reviewer believes that the author has attained his objective of putting the problem of industrial cancer in its proper perspective from a practical standpoint. This monograph is recommended for medical students, industrial physicians, and practitioners who have industrial workers among their patients.

LT. COL. CHARLES W. KRAUL, MC, USA

VASCULAR SPIDERS and Related Lesions of the Skin, by *William Bennett Bean*, M.D. 372 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $8.50.

The author of this book is a well-known teacher, investigator, and critic. He presents a compilation of material designed to offer a better understanding of disturbances of cutaneous blood vessels. His articulate, thoughtful, philosophical attributes show him to be, as always, the medical nonconformist par excellence. The result is an exciting parade of diseases of small vessels and large, common and rare, in most of which the skin is involved. The volume is a treasure-house of information derived from the author's own observations and from the literature (nearly a thousand references are listed). The subject of vascular spiders and palmar erythema occupies the first third of the book. From there, he goes on to examine in meticulous detail almost every conceivable anomaly of the cutaneous vasculature. He deviates from time to time as the fancy strikes him, to encompass diseases not primarily in the boundaries of his subject—for instance, pellagra, Cushing's syndrome, nail dystrophies, and fascial hernias. All this makes for thoroughly enjoyable reading. Many fields besides internal medicine and dermatology are included in his wide range of interest and knowledge. The dermatologist, particularly, should appreciate the technics and dynamic approaches of this morphologically-minded physician who would restore the role of observation to its erstwhile pre-eminence as the useful tool of the clinician. He answers innumerable questions, many from data personally recorded on the ward, some by hypotheses and speculations formulated from years of thought devoted to the material. His writing is unlabored, direct, lucid, and free of circumlocution. The book can be recommended unhesitatingly to physicians in every field of medicine.

COL. ALLEN D. SMITH, USAF, MC

MATERNITY, A Guide to Prospective Motherhood, by *Frederich W. Goodrich, Jr.*, M.D. 130 pages; illustrated. Prentice-Hall, Inc., Englewood, N.J., 1959. Price $1.75.

This inexpensive, readable maternity guide not only presents the course of pregnancy in an orderly manner but also points out its possible complications in an unalarming way. It discusses briefly, but thoroughly, common complaints

and problems the prenatal patient experiences and explains the necessary procedures for prenatal care. There is an excellent chapter for expectant fathers, an easily understood dietary and weight appendix, and it is well indexed. The author has skillfully avoided any controversial subjects of prenatal care. This book should prove of immense value both from the standpoint of educating patients and decreasing the time spent by the busy physician in bringing out these points in interviews.

COL. HAROLD E. HARRISON, MC, USA

PRACTICAL ORAL SURGERY, by *Henry B. Clark, Jr.*, M.D., D.D.S. 2d edition; thoroughly revised. 569 pages; illustrated. Lea & Febiger, Philadelphia, Pa., 1959. Price $9.50.

This excellent publication should have considerable appeal to the specialty student of oral surgery, and to the practicing oral surgeon. Its weakest point is hardly worth mentioning; it appears in the preface, as the author's purpose that this book be "a concise text for student and general practitioner." Quite likely this modest objective is not realized except perhaps in local areas. Actually, the material is effectively and thoroughly presented on a level seemingly above that of the undergraduate student. There are excellent chapters on instrumentation in oral surgery, exodontia technics (well supported with diagrammatic sketching), and an evaluation of current drugs and pharmaceuticals that will be of interest to the busy general practitioner. But the very "heart" of the book deals with subjects like: (a) medical conditions of importance in oral surgery, (b) oncology, (c) corrective surgery for deformities such as cleft lips and palates, mandibular prognathism and retrusion, (d) fractures of facial bones, (e) fulminating infections of bone and soft tissue, (f) dental problems involving the maxillary sinus, and (g) hospital practice. These are major oral surgical problems rarely managed by undergraduate students and commonly referred elsewhere by busy general practitioners. Nevertheless, the text is considered a desirable addition to the dental literature, written by an author who is capable, qualified, experienced, and effective as a teacher. It is recommended to all readers of dental literature despite its overwhelming appeal to the oral surgeon, rather than to the "student and general practitioner."

CAPT. THEODORE A. LESNEY, DC, USN

MODERN TRENDS IN DISEASES OF THE VERTEBRAL COLUMN, edited by *Reginald Nassim*, B.M., F.R.C.P., and *H. Jackson Burrows*, M.D., F.R.C.S., F.R.A.C.S., with 15 contributors. 303 pages; illustrated. Paul B. Hoeber, Inc., New York, N.Y., 1959. Price $15.

This is an excellent symposium of concise articles on most of the significant affections of the spine contributed by 15 outstanding British orthopedists, radiologists, neurosurgeons, pathologists, and anatomists. There is an introductory discussion of 30 pages of the embryological development of the spine and subsequent residuals of anomalies. The photographs, drawings, and roentgenographic reproductions are all pertinent and of good quality. The book's format and organization are attractive and logical, and the articles read easily. One of its attractive features is that it is surprisingly thin and portable for all its comprehensive content. This volume provides a quick review of essentials of major involvements of the vertebral column, and would be especially valuable to residents in orthopedic surgery and as a ready, safe reference for all surgeons.

CAPT. WALTER R. MILLER, MC, USN

DIFFERENTIAL TREATMENT AND PROGNOSIS IN SCHIZOPHRENIA, by *Robert D. Wirt*, Ph. D., and *Werner Simon*, M.D., with six contributors. 198 pages. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $6.50.

This authoritative study describes primarily a carefully controlled investigation of chlorpromazine and reserpine in comparison with each other and with traditional treatments such as electroshock, insulin coma, and psychotherapy. The patients selected were first admissions, with no history of previous treatment for schizophrenia and with no prior tranquilizing medication. The results suggest that those treatments, including tranquilizing drugs, which after careful diagnostic study are specifically prescribed for the unique needs of the individual patient are the best treatments. The authors consider it premature to discard such treatments as insulin coma, electroshock, and psychotherapy in favor of the tranquilizing drugs. Beyond this, their results indicate that chlorpromazine (a relatively inexpensive and easily administered form of treatment) does almost as much good for the short-term relief of symptoms as do the more intensive and complex therapies. In the 30-day period reserpine had little more beneficial effect than hospitalization alone. The discharge data after the 30 days' evaluation period indicate that all of the patients who received intensive psychotherapy were in the improved discharge group and all the patients who refused treatment were in the unimproved discharge group. Those receiving psychotherapy were, of course, those selected as good therapeutic risks for this treatment. At might be expected, the adjustment of the patients one year after discharge was more often unsatisfactory than not: less than ten percent could be rated as showing no symptoms of the type for which they were hospitalized; about one third of the patients were rated as clearly improved; the rest were not improved, over 40 percent requiring further care at home or in mental institutions. This volume is an excellent guide to those physicians, psychologists, social workers, and others interested in worthwhile psychopharmacological research, and should certainly be carefully perused.

COL. PHILLIP B. SMITH, MC, USA

THE ESSENTIALS OF ROENTGEN INTERPRETATION, by *Lester W. Paul*, M.D., and *John H. Juhl*., M.D. 839 pages; illustrated. Paul B. Hoeber, Inc., Medical Book Department of Harper & Brothers, New York, N.Y., 1959. Price $25.

This book, whose title accurately reflects the scope of its subject matter, fulfills the purpose of the authors, who aimed to prepare a textbook for medical students and a source of reference for practicing physicians and surgeons. Written in a clear and concise style, this work avoids the extremes of brevity of an elementary text and the minutely detailed phraseology of the multivolumed sets. The six sections deal with the osseous system, the brain and spinal cord, the abdomen and gastrointestinal tract, the urinary and female genital tracts, the chest, and the face, mouth, and jaws. The logically organized text, supplemented by 1,203 illustrations, all of excellent quality, permits the reader to obtain a clear understanding of the great number of conditions encountered in roentgenologic diagnosis. In addition to the radiologic features of these disorders, pertinent clinical and pathologic information is included to make a well rounded, timely discussion of most of the more common items of interest to the radiologist. The various special methods of examination in-

cluding fluoroscopy and those studies involving the use of contrast material are described in detail. These descriptions include accounts of the hazards in the use of contrast substances and of the precautions involved in their prevention. Although radiologists and residents in radiology will generally find this a useful reference, by and large the brevity of description of the less common conditions and the tendency to concentrate on "typical" appearances, although intentional, limit the value of the work.

COL. HARRY L. BERMAN, MC, USA

DENTAL-MEDICAL EMERGENCIES AND COMPLICATIONS, by *Ira Jay Berlove*, D.D.S., M.D., F.A.C.D., F.I.C.S. 380 pages. Year Book Publishers, Inc., Chicago, Ill., 1959. Price $7.50.

This book is directed primarily to the general practitioner in dentistry and medicine. The author states that his purpose is "to help the general practitioner of dentistry and the specialists in various fields of dental and oral surgery, as well as the medical practititioner." The oral surgeon will regard many of the minutiae discussed in this book as routine cases encountered in daily practice. The author attempts too broad a coverage of material in such a compact book. Some of the topics covered are not actual emergencies or complications, and are adequately covered in detail in standard textbooks of general and oral pathology. Examples are: leukoplakia, page 251, and mouth breather's gingivitis, page 308. Many topics such as these are discussed at the expense of an adequate presentation of complications and emergencies. An excellent discussion of the diagnosis and control of facial pain is presented for the general practitioner who is primarily concerned with pain of dental origin. Other helpful topics discussed include diagnosis and treatment of allergic responses to local anesthetics, and a detailed description of the technic of tracheostomy. The general dental or medical practioner who does not readily have access to consultation with a competent oral surgeon will find this book to be helpful on the management of acute problems that rarely occur in routine practice. It is well organized and indexed for ready reference.

COL. RICHARD J. BURCH, USAF, DC

THE YEAR BOOK OF ORTHOPEDICS AND TRAUMATIC SURGERY (1958–1959 Year Book Series), edited by *Edward L. Compere*, M.D., F.A.C.S., F.I.C.S., with a section on Plastic Surgery, edited by *Neal Owens*, M.D., F.A.C.S., F.I.C.S. 445 pages; illustrated. Year Book Publishers Inc., Chicago, Ill., 1959. Price $7.50.

This concise volume reviews pertinent current literature of orthopedic surgery and traumatology. Easy to read and well written, it continues to be of particular interest to the experienced surgeon as well as residents in training. Abstracts of significant articles are presented in a bold and clear manner with representative illustrations of excellent quality. The editorial comments are especially thoughtful and emphatic. Timely problems relative to wound infections, bacterial carriers, metal endoprostheses, diseases and injuries of elderly patients, and highway accidents are stressed. In addition, attention of the reader is directed to the valuable section on plastic surgery edited by Dr. Neal Owens. Tribute is paid to Dr. Edward L. Compere for a highly commendable job in editing this volume and the preceding eleven editions of this popular year book.

COL. EARL W. BRANNON, USAF, MC

MAMMALS OF NORTH AMERICA, Volumes I and II, by *Raymond Hall*, Ph. D., and *Keith R. Kelson*, Ph. D. 1,083 pages; illustrated. Ronald Press, New York, N.Y., 1959. Price $35.

These two volumes provide an annotated list of the orders, families, genera, species, and subspecies of mammals that have been described from the North American continent as far south as Panama, and from the adjacent seas. All taxonomic names are listed very carefully, together with the appropriate sources. Also very complete locality records have been assembled from the literature and used to construct distributional maps of all the species and subspecies which are recognized as valid by the author. There are keys for identification of major and minor groups, but these are not very clear and often simply based on localities. These are useful, if at all, only to the specialist. There are few good descriptions of external characteristics and color, and they are not sufficiently supported by the quality of the illustrations. Biologic data are few and sketchy. This book may be used for quick orientation and can be useful in the hands of the critical and trained observer, although it is principally based on Miller and Kellogg's *List of North American Mammals*, itself admittedly a compilation. It cannot be recommended to the epidemiologist. The distributional maps, not being based on original critical revision of groups which one would expect in such a pretentious and expensive work, are unreliable. For simple identification of species a number of excellent field books are available; some of these are far more practical than this work.

COL. WARREN C. EVELAND, MSC, USA

A SYNOPSIS OF PHARMACOLOGY, With Special Application to Dentistry, by *V. C. Sutherland*, Ph.D. 267 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $4.

This is a new publication in the field of pharmacology, prepared to meet the needs of students taking an introductory course in pharmacology. The book is well organized according to the therapeutic action of drugs. The author has been forced to be dogmatic in his presentation because of the compact nature of the book. However, the contents are accurate and quite adequate for the purpose for which the book was written. The illustrations have been well chosen to point out the more important theoretic principles involved in an understanding of drug action. For example, the chapter on the autonomic nervous system is especially well written and illustrated and would serve as an excellent quick review of the latest thinking in autonomic pharmacology. The compactness and the outline style of this book necessarily limit its usefulness somewhat; however, the more advanced student and practitioner will find it valuable as a general review.

MAJ. ROY L. MUNDY, MSC, USA

INTRACRANIAL CALCIFICATION, by *Fermo Mascherpa* and *Vincenzo Valentino*. 150 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $9.50.

This is a monograph on normal and pathologic intracranial calcification as seen on plain films of the skull. The section on normal or nonpathologic calcification is very inclusive and numerous illustrations demonstrate the sites and radiographic appearance of this condition. It is the authors' contention that calcium can be selectively and characteristically deposited in parasitic, inflammatory,

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granulomatous, vascular, degenerative, and endocrine disturbances. Numerous illustrations of the various diseases that may produce this abnormal calcification are presented. The authors have extensively compared their findings with the available literature on these subjects to demonstrate how accurate diagnosis can be on the basis of abnormal calcification. The illustrations reproduced in this book are drawn from the extensive cases collected over a period of many years. The authors freely correlate their findings and conclusions with those of others. They are frank and concise in their agreement with, or criticism of, the interpretations previously presented by other workers in this field. They have made every attempt to document their conclusions by illustrations, charts, and text. Since this book is based mainly upon the experiences and radiographic files that the authors have available to them, it is not to be expected that every type of pathologic intracranial calcification would be presented in this work. However, with few exceptions, the majority of the processes producing intracranial calcifications are included. Since there are few books dealing with intracranial calcification written in the English language and since the literature on this subject is so widely dispersed in separate articles, this book is an excellent source of reference for the subject. An extensive bibliography from European and American sources is included. The book was written mainly for neurologists, neurosurgeons, and radiologists, but it would be well for all medical practitioners who have to view plain films of the skull to review the excellent section on nonpathologic intracranial calcification.

CAPT. EDWARD A. SHELDON, USAF, DC

PHYSIOLOGY OF CARDIAC SURGERY, Hypothermia, Extracorporeal Circulation and Extracorporeal Cooling, by *Frank Gollan*, M.D. 96 pages. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $4.50.

This small but timely book of three chapters is by an author eminently qualified to write in this field. His colorful style adds considerably to the ease with which the reader assimilates the facts of basic physiology. The text contains pertinent observations from the great physiologists as well as from the savants of lay literature. In the list of references may be found the significant reports on hypothermia and extracorporeal circulation. In the first chapter the author covers all phases of hypothermia, including a discussion of certain military aspects, and concludes with suggestions as to future research in the area of stagnant flow. The second chapter reviews the historical development of oxygenating mechanisms, and contains a warning to the surgeon who would seek to "get away with as little blood as possible." The author believes that the evidence is strongly in favor of anoxic injury from an inadequate perfusion, not from overoxygenation. The final chapter implies a need for further investigation into the realm of selective cooling, simultaneous but selectively varying flows, and extracorporeal cooling in general. The material stated therein certainly justifies the recent interest in heat exchangers. All physicians and surgeons who appreciate the privilege of being able to apply the principles of basic and practical physiology to their clinical practices will profit from reading this book. It is directed particularly to the cardiac surgeon—he who has made the double trek: from the laboratory to the operating room, and with knit brow, back to the laboratory. It should inspire those with current passions in these fields to return with renewed vigor to their laboratories.

COMDR. A. C. HERING, MC, USN

THE MANAGEMENT OF ORAL DISEASE, A Treatise on the Recognition, Identification and Treatment of Diseases of the Oral Regions, by *Joseph L. Bernier*, D.D.S., M.S., Colonel, DC, USA. 2d edition. 875 pages; illustrated. C. V. Mosby Co., St. Louis, Mo., 1959. Price $15.

This book goes far in resolving some of the frustrations of the clinician who treats oral tissues. These include the clinical similarity of many oral lesions; the frequent dissimilar appearance of dermatologic-like lesions of the mouth and their counterparts on skin; and, particularly, the subtle differences between oral and general pathology. For oral pathology deals almost exclusively with living tissues, while general pathology deals more with both living and dead. Accordingly, the author presents oral pathology as it concerns these living tissues in their specialized area, including appropriate comparisons. This does not mean that "diagnosis," with its limited application, which usually consists of a photographic type of identification, is his goal. He prefers "management" for its broader implication of recognition, identification, and treatment. Thus we should recognize disease through its etiology, tissue changes, and evaluation of the patient. We may identify it by clinical appearance, histopathology, and laboratory findings. And only then may we logically direct treatment. Disease is a process, rather than an irrevocable plight, and therefore amenable to "management." The text achieves that rare desirable quality of being factually complete as a reference without a useless filigree of inconsequential minutiae from ages past. All the standard entities are excellently grouped and covered, with the added seasoning of refreshing comment based on a lifetime of devoted effort and unique personal experience. With such management, there can be no question of propriety in including a chapter or two on fundamentals. "The Interpretation of Signs and Symptoms" is a beautiful exposition of analytic evaluation of the patient, from his subjective pain through laboratory procedures, biopsy, and the general adaptation syndrome. So smooth is the flow of thought throughout, that even proofreaders were carried away. For a summary, Colonel Bernier's comment seems appropriate: "To eliminate symptoms without having established the nature of the disease process which has produced them is never the correct approach to therapy."

LT. COL. JULES D. KARTMAN, USAF, DC

CLINICAL DERMATOLOGY, for Students and Practitioners, by *Harry M. Robinson, Jr.*, B.S., M.D., and *Raymond C. V. Robinson*, B.S., M.D., M.Sc. (Med.), with 6 collaborators. 242 pages; illustrated. Williams & Wilkins Co., Baltimore, Md., 1959. Price $8.50.

The authors, Drs. Harry M. Robinson, Jr., and Raymond C. V. Robinson, are well known to all interested in dermatology. Both are associated with the University of Maryland School of Medicine, Dr. Harry M. Robinson, Jr., being head of the division of dermatology. Morphologic dermatology has been taught with considerable success for many years at the University of Maryland and it is gratifying that publication of this method has become a reality. The more common dermatoses are discussed and suggestions made concerning treatment. The text is divided into two parts. Part I, titled "General Considerations," begins with anatomy of the skin, briefly discussing all phases of dermatology. Part II, "Morphologic Dermatology," presents a logical approach to the more common cutaneous problems. Throughout the text the authors emphasize the necessity for a complete history and physical examination, plus the use of laboratory findings to confirm the clinical diagnosis. The skin is described as the

largest organ in the human body and therefore acts as a mirror for disturbances in normal physiologic functions and pathology of the body as a whole. The text is designed primarily for beginners; however, one with experience in dermatology will find much ready information available in the many illustrations, charts, and tables.

COL. ALLEN D. SMITH, USAF, MC

THERAPEUTIC ELECTRICITY AND ULTRAVIOLET RADIATION. Volume IV of Physical Medicine Library, edited by *Sidney Licht*, M.D. 373 pages; illustrated. Elizabeth Licht, Publisher, New Haven, Conn., 1959. Price $10.

This volume is especially helpful for specialists in physical medicine as it gives the basic physics and electrical principles of engineering in a language that can be comprehended. The various contributors have used diagrams for visual aids of parts of machines showing each step being discussed. Electricity as used medically is often misunderstood. The average practitioner or technician prefers to push a button and hope the machine will operate. Although this volume is not intended to be a technical volume it does give one an easy consolidated access to the theory concerning how and why, as well as technics and clinical application. The ultraviolet section is the most recent composite of units on this subject, which is as old as mankind. It has been compiled to include the instrumentation, the physiologic effects, and the experimental and practical clinical application, which is excellent. LT. COL. JAMES D. AMOS, MC, USA

MODERN DERMATOLOGIC THERAPY, edited by *Thomas H. Sternberg*, M.D., and *Victor D. Newcomer*, M.D. 520 pages; illustrated. The Blakiston Co., McGraw-Hill Book Co., Inc., New York, N.Y., 1959. Price $10.

This book is a compilation of various dermatologic subjects developed from courses presented in the Medical Extension Division, University of California, Los Angeles. The 26 chapters review recent developments in research in dermatology and cover common and uncommon dermatoses encountered in practice. As the title implies, the subject matter deals with modern therapy in these diseases and syndromes primarily, although in a few instances a short basic, historical and descriptive note is included for completeness. It is not intended as a dermatologic textbook but rather should be considered as an *ad interim* reference volume representing the latest thinking on the subjects presented by leaders in dermatologic teaching, all of whom are well qualified and who specialize, at least to some extent, in their respective subjects. There are three chapters on the psychosomatic aspects of cutaneous diseases from the psychiatrist's viewpoint. In an excellent discussion of steroids, their use, abuse, contraindications and limitations are emphasized. A chapter on the current therapy of cutaneous infections caused by the staphylococci and streptococci is timely, and informative. There is an important chapter on the use of antibiotics, other than penicillin, in the treatment of syphilis which is particularly timely in view of the many penicillin reactions reported in the last few years together with the current upsurge in the number of cases of syphilis. This chapter also includes the current dosage schedules recommended by the U.S. Public Health Service for the treatment of various stages of syphilis with penicillin. This is an excellent book for dermatologists, internists and practicing physicians in general and should be included in every hospital library and physician's office.

LT. COL. EARL S. HALLINGER, JR., MC, USA

THE PSYCHIATRIC NURSE IN THE GENERAL HOSPITAL, by *Mary A. Tudbury*, R.N., A.B., M.S., with a preface by Leo Alexander, M.D. 83 pages. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $3.50.

This book is an outcome of studies conducted on a psychiatric ward in a general hospital. The author points out in her introduction that because the ward studied was a specific unit for psychotherapeutic research, the results of the study may not be applicable to other psychiatric wards in a general hospital. The five chapters deal with the statement of the problem, purpose, methodology and underlying philosophy of the study, presentation of two cases, discussion of data collected, and conclusions and recommendations. A suggested reading list and an appendix of sample type questions used in interviewing patients and staff members are included. The purpose of the study is to clarify the role of the present psychiatric nurse in this institution, to compare this role with the defined role of the psychiatric nurse expert, and to learn what recommendations can be made in regard to training and utilizing the psychiatric nurse expert in such a unit. The study reveals that the present nurse is not really included as a member of the team, is expected by the medical staff to concentrate only on following doctors' orders and/or ward administration; that communications between medical and nursing staff are poor, and that the psychiatric nurse expert who participated in the study, although free of all administrative duties, was warned by the medical staff to avoid any involvement with patients. Only 29 percent of the present nursing activities relate directly to patient care, 56 percent involve administrative duties, and the remaining 15 percent are taken up with education activities and participation in human relations. It is shown that the nurse who is able to spend more time with patients can increase effectively the therapeutic environment, that the recovery of the patient is not restricted to the therapist's office but is subject to ward influences and the cooperative effort of all personnel. Recommendations include that the nurse spend less time in administration, more time with patients, that she be included in over-all plans for patient care, and that communications between medical and nursing staff be increased. Miss Tudbury has demonstrated very clearly in this book that the full potential of the nurse cannot be realized if she is not really included as a full-fledged member of the psychiatric team; that nursing therapy does not infringe on the doctor's prerogative as the therapist, but can aid the doctor much more than at present, as well as improve total patient care. This book, while brief, presents clearly the pertinent aspects of psychiatric patient care in a general hospital, and should be of great interest and value to any nurse or doctor concerned with this problem.

MAJ. CHARLOTTE R. RODEMAN, ANC, USA

A TEXT ON SYSTEMIC PATHOLOGY. Volume II, edited by *Otto Saphir*, M.D., with eight contributors. 1,950 pages; illustrated. Grune & Stratton, Inc., New York, N.Y., 1959. Price $38.

One of the guiding motives for this work was to provide the medical student and the practicing hospital pathologist with more specialized information than is usually found in general textbooks on pathology. Also, it was hoped that by including references to important clinical signs and symptoms and to functional aberrations encountered in the course of a particular disease, pathology would be elevated above the realm of strict morphology and become "alive" and more meaningful to both the clinician and the pathologist. Larger than volume I, this second and final volume consists of 13 sections which deal with the pathology of the gastrointestinal tract, ear, eye, nose, throat, liver, pancreas,

endocrine glands, skin, organs of locomotion, and the nervous system. In 6 of the 13 sections the editor is either the author or coauthor, the other 7 sections having been written by one or the other of the collaborators. In general the text is well written and the subjects discussed are well covered in a lucid and readable manner. A great fund of information is presented. For the most part the pathology of each entity, both gross and microscopic, is discussed in relation to clinical signs and symptoms and augmented by etiologic and brief statistical data. The comprehensive section on skin is alloted a greater proportion of space than is usual in most texts on pathology. The same may be said for the section on the eye and ocular adnexa, which is superbly written and profusely illustrated. This section on the ear is somewhat sketchy and the arrangement of subject matter of the section on the teeth is at variance with the usually accepted concepts as set forth in other textbooks. The book is not without omissions, errors and misquoted references, but these discrepancies are probably minimal in the first edition of a text of this size. There are a large number of references which are arranged alphabetically at the end of each section. These two volumes should prove to be a ready source of reference information to medical students, clinicians and pathologists.

CAPT. W. M. SILLIPHANT, MC, USN

THE BIOCHEMISTRY OF CLINICAL MEDICINE, by *William S. Hoffman*, Ph. D., M.D., F.A.C.P. 2d edition. 734 pages; illustrated. Year Book Publishers, Inc., Chicago, Ill., 1959. Price $12.

To the many clinicians who are frequently faced with difficult problems of diagnosis, treatment, and understanding of the fundamental concepts of disease, this volume serves as an excellent reference work. Likewise, it is well designed for the medical student and physician in residency training status. The author writes with clarity, conciseness, and an objectivity that is indeed refreshing. He does not attempt to overwhelm the reader with the technical aspects of biochemistry, numerous complex formulas, or mathematics. On the other hand, the subject matter is presented in a manner thorough enough to indulge even the most discerning clinician. Particular emphasis is given to such diseases as diabetes mellitus, hepatitis, cirrhosis, Bright's disease, and gout. These entities are discussed in great detail, clinically as well as physiologically. The chapter devoted to diabetes, for example, is especially well written and includes information on oral hypoglycemic agents as recently released as D.B.I. and chlorpropamide. Although not profusely illustrated, there are sufficient diagrams, tables, charts, and photographs, to summarize and clarify the written material in a most adequate manner. In summary, this second edition of an already well-accepted text is definitely worth the attention of those students and practicing physicians who desire to understand the physiologic basis for disease and its management.

CAPT. ROBERT J. WHIPPLE, MC, USN

UROLOGICAL NURSING, by *David M. Davis*, M.D., and *Kenneth C. Warren*, M.D., 6th edition. 196 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $3.75.

This is a clear, concise presentation of the nursing care of patients with urological conditions. As such, it is a text that can easily be understood or explained to nonprofessional personnel—an important consideration in military nursing services. The inclusion of current procedures and the usage of newer drugs in the treatment of urological conditions make this textbook almost a

necessity for the ward library of a urology service. The illustrations and their explanations enable one readily to utilize the text as a visual aid in orienting personnel to various procedures. Its brevity, yet all-inclusiveness, are factors to be considered as important in selection of a textbook. As in the past, I still find it the textbook of choice in teaching and maintaining the high standards of urological nursing.

MAJ. ANTHONY A. BORSKI, MC, USA

MEDICAL AND SURGICAL NURSING II, by *Amy Frances Brown*, R.N., B. Ed., M.S. in N., Ph.D. 850 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $8.

The need of the student and graduate nurse to have available in one text some of the basic concepts of nursing care in the specialized surgical disease entities is met in this book. The inclusion of much of the material on medical nursing from the author's third edition of *Medical Nursing*, published in 1957, is questioned because of the cost of this type of book. It would seem a smaller volume related to the surgical specialities would have sufficed at this time since there is frequent referral to the earlier volume. Among the new material, the inclusion of a section on medical and surgical emergencies will be of interest to the nurse practitioner who has not been recently engaged in her profession. The discussions of orthopedic nursing and neurological nursing are to be especially recommended for the excellent coverage of nursing skills demanded and opportunities provided in the rehabilitation of these patients. Other sections on dermatological nursing and on gynecologic and urologic nursing are of value in terms of teaching cancer prevention and rehabilitation. The author has again drawn extensively from her own varied nursing experience and that of some of her colleagues noted for their contributions in specialized nursing areas. Students and graduates will find this a worthwhile text for its broad coverage of nursing in the care of the sick and injured.

MAJ. EVELYN M. BEDARD, USAF, NC

HIGH SPEED AND ULTRA SPEED IN DENTISTRY, Equipment and Procedures, by *Harold C. Kilpatrick*, D.D.S. 289 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $8.50.

This volume is a timely contribution to dental science. The subject matter, including over 600 illustrations, is composed of information from 19 commercial firms and comments from 14 professional contributors. The first part of the book consists of five chapters devoted to equipment and instruments and is made up largely of illustrations from manufacturers' service sheets, and data and research notes by the author and others. All available types of dental handpieces and accessories are described, and the good and bad points of each type are emphasized. One entire chapter is devoted to maintenance and trouble-shooting for handpieces. This chapter alone might prove to be worth many times the cost of the entire volume by acquainting the operator with instrument saving maintenance information or through guidance in diagnosing an obscure mechanical defect in equipment. The second portion of the book consists of 13 chapters and an appendix devoted to procedures in the use of high-speed equipment and accessories. Technics for preparation of various cavity types are covered by authorities in the field of restorative dentistry. Cutting instrument selections are outlined and illustrated. This book should prove valuable to any practitioner who is using high-speed handpiece equipment or who plans to equip his office with these modern, timesaving instruments.

COL. DONALD C. HUDSON, USAF, DC

DISEASES OF METABOLISM, Detailed Methods of Diagnosis and Treatment, edited by *Garfield G. Duncan*, M.D., with 22 contributors. 4th edition. 1,104 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $18.50.

This fourth edition of this reliable work represents a further improvement over previous editions, and indicates the growing nature of this subject. The present volume is unusually complete with respect to choice of subject matter, with perhaps some special emphasis on carbohydrate metabolism. With respect to the latter, there is an outstanding contribution by Dr. Rachmiel Levine, with separate articles by Dr. Duncan on diabetes mellitus and spontaneous hypoglycemia, Dr. Priscilla White on juvenile diabetes, and Dr. Abraham Cantarow on melituria. There are excellent contributions by Dr. Louis Welt on water balance in health and disease; and mineral metabolism by Dr. Abraham Cantarow, in addition to authoritative reviews of the subjects of vitamins and avitaminoses by Dr. Tom D. Spies and his group; undernutrition, by Dr. Ancel Keys, porphyrin metabolism by Dr. Cecil Watson, and gout by Drs. Walter Bauer and Evan Caulkins. Special attention is given to diseases of the thyroid and diseases of the kidney, as well as the expected subjects of obesity, fat and protein metabolism. There are numerous illustrations and figures, and the bibliography is complete and up to date. If any criticism were to be directed at this volume, it might be that there is too much emphasis on carbohydrate metabolism and diabetes specifically, and that perhaps more discussion might have been devoted to a consideration of certain inborn errors of metabolism or heritable disorders of connective tissue which might be on a metabolic basis. The present volume is a worthwhile contribution to current literature on this subject, and lives up to its promise in the subtitle of providing detailed methods of diagnosis and treatment. There is no work of comparable scope or merit currently available on this subject.

CAPT. PAUL J. ROSCH, MC, USA (RET.)

SURGERY OF THE STOMACH AND DUODENUM, by *Claude E. Welch*, M.D., D. Sc. (Hon.). 3d edition, revised. 405 pages; illustrated. Year Book Publishers Inc., Chicago, Ill., 1959. Price $9.75.

The third edition of this handbook is divided into 23 concise and short sections. The first five sections are devoted to anatomy, a short historical summary, pre- and postoperative treatment, specialized instruments, and the various incisions used. The last three take up rare diseases of the stomach, duodenal fistulae and hemorrhage due to portal hypertension. Other sections are devoted to descriptions of operations, and in some instances to a short statement of indications and possible complications or sequelae. Discussion is limited and almost entirely technical in nature. No attempt is made to discuss diagnosis, physiology, or pathology. This is not a textbook of surgery but is a ready reference for various operations commonly performed on the stomach and duodenum. There is liberal use of illustrations, all well done, which helps to clarify the text for those not entirely familiar with the specific procedure under discussion. A table of normal laboratory values for blood and gastric conditions is included in Appendix I, and two sample postoperative diets are presented in Appendix II. The bibliography is adequate and the volume is well indexed. To the young practitioner this handbook should prove to be a valuable quick reference on technic. For details of any specific operation the original articles can be identified from the bibliography.

BRIG. GEN. CLINTON S. LYTER, MC, USA

SURGERY OF THE PROSTATE, by *Henry M. Weirauch*, M.D., F.A.C.S. 535 pages; illustrated by *Halcyon Harris Cowles* and *Ralph Sweet*. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $15.

This volume provides a detailed discussion of the currently accepted standard prostate operations as well as a representative selection of valuable alternative technics. Emphasis is placed on the safe aspects of some procedures and the pitfalls of others while showing that some technics are unsatisfactory under some circumstances yet valuable under others. An interesting historical review of prostatic surgery includes the development of each of the four modern approaches as well as a résumé of those methods that have become obsolete. Preoperative care is very well covered and includes criteria indicating when adequate preparation has been completed; equally well done is the chapter on postoperative care and management of complications. One chapter covers the choice of operation to fit the problem at hand. Of special interest is the presentation of the problems encountered by the anesthetist, the appreciation of which makes the urologist better able to perform the operation and evaluate the influence of the anesthesia on the postoperative course. In addition, the potential postoperative effects of complicating medical conditions are discussed.

Much of this new text is actually an atlas of surgery. The numerous illustrations of surgical technics are unusually clear and accurate in detail.

The practical application of high frequency currents is clearly presented. The modern concept of micturition and causes of urinary incontinence are covered in some detail. One chapter, beautifully illustrated in color, is devoted to surgical pathology; another chapter deals with the surgical anatomy of the prostate and includes a reminder of the fact that the prostate contains striated muscle. The differentiation between benign prostatic hyperplasia and prostatic carcinoma is lucidly presented. One most interesting and thought-provoking chapter deals with the future of prostatic surgery. The book is an outstanding guide for the urologist to all standard procedures for the surgical management of prostatic diseases. It is filled with those subtle refinements in technic and supportive care that can mean success or failure in prostatectomy. I enthusiastically recommend it as a valuable and outstanding addition to every medical library and particularly to the personal library of urological residents and others training in urology as well as those doctors engaged in the practice of urology.

COL. LOUIS K. MANTELL, MC, USA

SURGICAL PATHOLOGY, by *Lauren V. Ackerman*, M.D., in collaboration with *Harvey R. Butcher, Jr.*, M. D. 2d edition. 1,096 pages; illustrated. C. V. Mosby Co., St. Louis, Mo., 1959. Price $15.

The second edition of this work is unique in that it represents collaboration between the pathologist and the surgeon. Dr. H. R. Butcher, Jr., associate professor of surgery at Washington University, assisted in the preparation and editing of the text. The 26 chapters and 1,114 illustrations afford a comprehensive review of surgical pathology. The bibliography is excellent. The clinicopathologic correlation of each entity considered is extremely helpful in that the pathologist using this book as a reference can very quickly get an excellent review of all facets of a particular tumor or disease. Some of the illustrations suffer from the lack of sharp detail; however, this is a small detraction from the over-all excellence of the work. This book is a must for the pathologist and the surgeon.

COL. FRANK M. TOWNSEND, USAF, MC

TEXTBOOK OF MICROBIOLOGY, by *William Burrows*, Ph. D., with the collaboration of *Richard Janvier Porter*, Ph. D., and *James William Moulder*, Ph. D. 17th edition. 954 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $14.

In this, the era of novel length monographs, a text that succeeds in encompassing all areas of basic and applied microbiology without succumbing to the present vogue of two volumes is notable especially in the 17th edition of a time-honored work. The range of this text is so inclusive that it suffers by necessity from lack of detail. For example, no mention is made of genus-delimiting amino-acid reactions in the enteric bacteria section. The omission entirely from consideration of *Mimeae-Herellea* (*Bacterium anitratum*) organisms is also surprising because these bacteria recently are becoming recognized as human pathogens. The chapter on medical parasitology is brief but includes a consideration of all the important parasites. Detailed descriptions and diagnostic methods are missing but references are adequate. The mycology illustrations are inferior to other photographs and the common fungal contaminants are ignored. The chapter concerned with viruses and viral diseases is excellent for the student desiring an introduction to the basic concept of virology, although technics for diagnosis again have been omitted. A certain undesirable dogmatism is evidenced in this section by the author in denying the possibility that cat-scratch fever could be of viral origin. This is of interest to the reviewer who, with associates, recently reported passage of a hemagglutinin of the agent in eggs. This text remains one of the finest available, however, and is particularly recommended for physicians. The fundamental modern theses of microbiology are included and presented in a very simple and understandable fashion.

LT. COL. CHARLES D. GRABER, MSC, USA

METALS AND ENGINEERING IN BONE AND JOINT SURGERY, by *Charles Orville Bechtol*, M.D.; *Albert Barnett Ferguson, Jr.*, M.D., and *Patrick Gowans Laing*, B.S., F.R.C.S. 186 pages; illustrated. Williams & Wilkins Co., Baltimore, Md., 1959. Price $8.

This monograph offers an interesting compendium of the biologic and engineering principles involved in the reconstruction of the skeletal system. To achieve their purpose the authors skillfully present a résumé of the work in this field since 1775 and add the results of their own very extensive and detailed research into the metallurgic and engineering problems encountered. The format and illustrations are excellent and the text is clearly written. Included is an engineering-orthopedic glossary that will be helpful to those readers who have not been previously exposed to the engineering terms used in the text. This book follows the trend to the increasing interdependence of the biologic and physical sciences. With it the orthopedic surgeon can become versed in the fundamentals of metallurgy and engineering necessary to practice his specialty. The book is not all inclusive and actually appears to be somewhat incomplete in that less than two pages are devoted to intramedullary fixation of bone and no mention is made of the new plastic internal fixation materials being developed. Nevertheless, the authors have made a very important contribution to surgery of bone and this volume should be considered required reading for anyone concerned with the treatment of fractures or reconstruction of the skeletal system. It is highly recommended for inclusion in the libraries of institutions offering residency training in surgery and orthopedics.

CAPT. HERBERT A. MARKOWITZ, MC, USN

SQUINT AND ALLIED CONDITIONS, by *George P. Guibor*, M.D., D.D.S. 356 pages; illustrated. Grune & Stratton, New York, N.Y., 1959. Price $11.50.

The author has written a book on squint which is a summary of his observations and experiences gained from his study of over 41,500 patients during the last 25 years. The book is not large, is easy to read, and covers the subject very well. The discussions of the methods of examination and treatment should be of particular interest to ophthalmologic students. The emphasis on the nonsurgical treatment of squint is of particular interest to older students. Many ophthalmologists will think the author is too conservative in his treatment, but on careful evaluation, they will find his use of cycloplegics and prisms is far from conservative, and his surgery is perhaps more radical than that of many. This book should be very interesting to all ophthalmologists and orthoptic technicians and should be in all ophthalmologic libraries.

CAPT. JAMES L. FUELLING, MC, USN

SCHIZOPHRENIA, An Integrated Approach, edited by *Alfred Auerback*, M.D. 224 pages; illustrated. Ronald Press Co., New York, N.Y., 1959. Price $5.50.

This book has been edited in an effort to present the current thinking and the present status of research and therapy of schizophrenia from the biochemical, neurophysiologic and communicative aspects. Outstanding psychiatrists, anthropologists, ethnologists, and psychologists present papers originally read in connection with the 1958 Hawaiian divisional meeting of the American Psychiatric Association. These are discussed or enlarged upon by others in the same field, giving a detailed and comprehensive overview not only of what is going on now and what direction thinking and research are taking, but also of the therapeutic potentials which each of these may indicate now and for the future. The results of these efforts are noteworthy and remarkable. Those with a narrow perspective regarding schizophrenia are shown the wide ramifications of the disorder in all phases of the patient's life. The confusing situation regarding matters such as the taraxein studies are discussed clearly and in detail. The review of the Russian literature on recent neurophysiologic research findings is interesting for information and for future study. A discussion of the psychotherapeutic aspects of schizophrenia is very readable. This excellent volume belongs in the library of all members of the psychiatric team, as well as physicians and counselors in social and religious fields. It could well be revised and republished in its present format on a biennial or other recurring basis to keep everyone abreast of the voluminous literature on this subject. The editor deserves commendation for his well balanced and careful presentation of the most complex subject in the field of medicine. There is an excellent index by name and subject and an adequate bibliography is given with each subject chapter.

LT. COL. PAUL SCHRADER, MC, USA

PATIENT CARE AND SPECIAL PROCEDURES IN X-RAY TECHNOLOGY, by *Carol Hocking Vennes*, R.N., B.S., and *John C. Watson*, R.T. 203 pages; illustrated. C. V. Mosby Co., St. Louis, Mo., 1959. Price $5.75.

This is a rather detailed, well written and illustrated book for the x-ray technician. It fills a long felt need for the student in x-ray technology and will be valuable for the trained technician's library. Care of the patient as an individual and not as another case is stressed throughout the book.

COL. PAUL A. PADEN, MC, USA

X-RAY AND RADIUM IN DERMATOLOGY, by *Bernard A. Wansker*, M.D. 114 pages. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $5.

The author presents a clear and concise discussion of the fundamentals of ionizing radiation as they apply to the practice of dermatology. The organization of the material is excellent and it is written with clarity. The size of the book precludes consideration of many details, but it was not the plan of the author that it be an exhaustive reference text. Residents in dermatology, those studying for the examinations given by the American Board of Dermatology, and practicing dermatologists should find this book both helpful and informative.

CAPT. JAMES H. LOCKWOOD, MC, USN

TEXTBOOK OF SURGERY, edited by *H. Fred Moseley*, M.A., D.M., M. Ch. (Oxon), F.A.C.S., (Eng.), F.R.C.S. (C). 3d edition. 1,336 pages; illustrated. C. V. Mosby Co., St. Louis, Mo., 1959. Price $17.

This surgical text is written for the medical student almost entirely by faculty members of McGill University and staff members of the Royal Victoria Hospital. The approach is basic, with integration of the preclinical sciences and the treatment is broad but capsular as is necessary in a general text. The surgical specialties are covered with the exception of eye, ear, nose, and throat, but gynecology is given a short presentation. Most of the color plates are by Frank Netter and the illustrations are pertinent and informative. Fractures are covered much more in detail than in most texts, with many excellent illustrations. The bibliographies with each chapter are current but also include some of the standard and historical references. In addition, at the end of each chapter is a listing of pertinent motion picture films. Chapters on pre- and postoperative care, radioactive isotopes, anesthesia, and surgical technic are included. The chapters are lucid, the plan is well conceived, the coverage is adequate, and the end result achieves the objective. This third edition includes advances in newer fields such as heart surgery and brings all the chapters up to date. The book is recommended for undergraduate students, and interns also will find it valuable.

COL. WARNER F. BOWERS, MC, USA

THE YEAR BOOK OF THE EAR, NOSE & THROAT, (1958–1959 Year Book Series), edited by *John R. Lindsay*, M.D., with a section on Maxillofacial Surgery, edited by *Dean M. Lierle*, M.D., and *William C. Huffman*, M.D. 395 pages; illustrated. Year Book Publishers, Chicago, Ill., 1959. Price $7.50.

This book, in common with the other annual volumes by recognized authorities in the different specialties, is not a comprehensive review of all the literature but a sampling by selection of the best and most representative of American and foreign publications. All divisions are represented, including maxillofacial surgery. Illustrations are well reproduced in black and white. All abstracted articles are followed with footnotes by the editors. The editing has been very careful, as no errors were found, either typographical or in context. This book furnishes the reader with an up-to-date review of the most timely topics in the specialty named in the heading, and is intensely practical from the specialist's point of view. It is quite a worthwhile investment for all otorhinolaryngolists.

CAPT. LEROY L. KENNEY, MC, USN

A TEXTBOOK OF MEDICINE, edited by *Russell L. Cecil*, M.D., Sc. D., and *Robert F. Loeb*, M.D., Sc. D., D. Hon. Causa, LL.D. 10th edition. 1,665 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $16.50.

In the 10th edition of this standard text of medicine, the authors have successfully maintained their leadership in the field by making the text more attractive. It has been brought up to date to a surprising extent when one considers the rapid advances and changes in medicine. The type is new and clearer and permits the addition of 36 articles on subjects never before covered in previous editions. These include adenoviral infections, ECHO viral infections, diseases of atypical acid-fast bacilli, thrombotic thrombopenic purpura, silo filler's disease, renal tubular acidosis, agammaglobulinemia, steroid physiology and metabolism, hyperaldosteronism, cryoglobulinemia and macroglobulinemia, and Tietze's and Marfan's syndromes. References after each article are highly selected and as recent as 1957. In addition to many previously familiar names, there are 32 new contributors to this edition which, indeed, represents a veritable "who's who" in medicine. This text, more than ever, continues to be a valuable reference source for all physicians, with the exception, perhaps, of only the most highly specialized.

LT. COL. JULES J. MC NERNEY, MC, USA

A MANUAL OF ANAESTHETIC TECHNIQUES, by *William J. Pryor*, M.D., Ch. B. (N.Z.), F.F.A.R.C.S. (Eng.), D.A. (Eng.), F.F.A.R.A.C.S., with a foreword by *J. H. T. Challis*, M.R.C.S. (Eng.), L.R.C.P. (Lond.), F.F.A.R.C.S. (Eng.), D.A. (Eng.). 2d edition. 228 pages; illustrated. Williams & Wilkins Co., Baltimore, Md., 1959. Price $7.

This small volume in outline form covers the whole field of anesthesia in a superficial manner. The author states the purpose of the book as "being an anesthetist's *vade mecum*, where he can look up any practical problems which confront him during the day-to-day administration of anesthetics." The treatment of the various subjects is too brief to be useful as a reference book. The book does contain anatomic and physiologic facts in capsule form, however, which help the anesthetist understand the basis for the technics. The evaluation of the technics is wholly clinical. This book is not recommended for the resident in anesthesia. Its principal value lies in a brief description of English equipment.

CAPT. DANIEL M. PINO, MC, USN

TUBERCULOSIS AND OTHER COMMUNICABLE DISEASES, by *J. Arthur Myers*, M.D., with 25 contributors. 499 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $14.50.

This book presents an excellent coverage of the diagnostic, therapeutic, preventive, and epidemiologic aspects of tuberculosis and other communicable diseases. It follows the general format of a textbook. As such it is ideally suited for both the student and practitioner seeking basic information. It achieves the highly important feature of a "reference" source for problems in infectious diseases. The authors have presented complete, pertinent coverage of each of the disease processes in short chapters which are exceedingly well written and organized. The subject material is well indexed, which permits a given subject to be quickly found. Well selected bibliographies are found at the end of each chapter which provide pertinent, supportive references. This book is both timely and essential, for it teaches that there is far more involved in the control and prevention of infectious diseases than just the use of antibiotics.

MAJ. JAMES C. SYNER, MC, USA

PRINCIPLES OF MICROBIOLOGY, by *Walter W. Krueger* and *Karl R. Johansson*. 2d edition. 563 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $6.75.

This book was written as a text for a course in microbiology at the college level. It has much to recommend it for this purpose such as its historical orientation, simplicity, and excellent questions. However, other similar texts introduce the student or general reader to the microbiologic world with more deftness, greater accuracy, and full coordination of subject matter. In any panoramic presentation of a very extensive subject such as microbiology, the expert in any phase of the subject will find errors. This book seems to have at least its fair share. For example, it is said that the endotoxins of bacteria posses little antigenicity and lack the definite specificity of exotoxins. There is some degree of truth in this statement, but it is misleading inasmuch as the endotoxins are good antigens and may act as adjuvants for other antigens. Moreover, the endotoxins are responsible for many of the characteristic serologic reactions of the gram-negative bacteria. Despite these criticisms, this book is highly readable and may serve well as an introductory text.

MAJ. LOUIS H. MUSCHEL, MSC, USA

GYNECOLOGY AND GYNECOLOGIC NURSING, by *Norma F. Miller*, M.D., and *Hazel Avery*, A.B., R.N., with a chapter on The Gynecology Operating Room, by *Mildred Quackenbush*, B.S.N. Ed., R.N., and a chapter on The Psychosomatic Approach to Gynecology, by *Sprague Gardiner*, M.D. 4th edition. 501 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1959. Price $5.50.

The gynecologist's ability to render service to his patients depends upon his nurse to a greater degree than in any other professional field, except perhaps obstetrics. She must not only assist him during examinations, but often has a unique opportunity to clarify his instructions, calm the patient's fears, or provide the patient with an opportunity to reveal intimate problems. A sympathetic, well-trained nurse may be a haven for the troubled, often overly modest, gynecologic patient. To help nurses maintain contact with the many advances in gynecology, the authors have not only revised the previous editions of their excellent book, but have added new chapters on psychology, gynecology in infancy and childhood, and in geriatrics, and terminal care for the advanced cancer patient. They emphasize repeatedly the importance of the nurses on the gynecologist's team and show them how they may render many invaluable services to the patient, emotionally and physically.

A large section, devoted to gynecologic nursing procedures, has been completely rewritten. Careful review of this section reveals that it contains all necessary basic information required and is presented in a clear, rapidly available manner. Each procedure is outlined and all generally used instruments are listed. This section will provide any untrained person with all the necessary details and information. The only omissions noted were that endometrial biopsy requires sterile instruments, and that douching equipment used by several patents should be sterilized. This book is considered to be required reading for all nurses caring for gynecologic patients, however infrequently, in the office or the hospital. Even the seasoned gynecologist will profit from it. It was a breath of fresh air to these reviewers because it brings back and emphasizes the art of nursing, an art that nursing schools seem to be neglecting.

LT. COL. WILLIAM F. PETERSON, USAF, MC
1st LT. LOIS WHITE, USAF, NC

New Books

Books received by the U.S. Armed Forces Medical Journal *are listed in this department for the information of readers, and as acknowledgment and appreciation of their receipt from the publishers. Those of greatest interest will be selected for review in a subsequent number of the* Journal.

The Year Book of Cancer (1958–1959 Series), compiled and edited by *Randolph Lee Clark, Jr.*, B.S., M.D., M.. Sc. (Surgery), D. Sc. (Hon.), and *Russell W. Cumley*, B.A., M.A., Ph. D. 569 pages; illustrated. Year Book Publishers, Inc., Chicago, Ill., 1959. Price $8.

Information Bulletin, Armed Forces Reserve Medical Officer Commissioning and Residency Consideration Program (A Plan for Residency Deferment). Department of Defense, Office of the Assistant Secretary of Defense (Health and Medical) Washington 25, D.C. U.S. Government Printing Office, 1959.

The Ecology of Human Disease, by *Jacques M. May*, M.D., with a foreword by *Felix Marti-Ibañez*, M.D. 327 pages. MD Publications, Inc., New York, N.Y., 1959. Price $7.50.

What Next, Doctor Peck? by *Joseph H. Peck*, M.D. 209 pages; illustrated. Prentice-Hall, Inc., Englewood Cliffs, N.J., 1959. Price $3.50.

Early Diagnosis, by various authors, edited by *Henry Miller*, M.D., F.R.C.P. 400 pages. Williams & Wilkins Co., Baltimore, Md., 1959. Price $6.50.

Color Atlas and Management of Vascular Disease, by *William T. Foley*, M.D., F.A.C.P., and *Irving S. Wright*, M.D., F.A.C.P. 170 pages; illustrated. Appleton-Century-Crofts, Inc., New York, N.Y., 1959. Price $18.

Orthopaedic Surgery, by Sir *Walter Mercer*, M.S., Ch. B. (Edin.), M. Ch. Orth. (Liv.), (Hon.), F.R.C.S. (Edin.), F.A.C.S. (Hon.), F.R.C.S. (Eng.), F.C.S. So. Af. (Hon.), F.R.C.S.I. (Hon.), F.R.S. (Edin.). 5th edition. 1,075 pages; illustrated. Williams & Wilkins Co., Baltimore, Md., 1959. Price $12.

Mycoses of Man and Animals, by *R. Vanbreuseghem*, M.D., authorized translation by *J. Wilkinson*, Ph. D., F.L.S. 235 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $10.50.

Synopsis of Ear, Nose and Throat Diseases, by *Robert E. Ryan*, B.S., M.D., M.S. (ALR), F.A.C.S., *William C. Thornell*, A.B., B.M., M.D., M.S. (ALR), F.A.C.S., and *Hans von Leden*, M.D., F.A.C.S., F.I.C.S. 383 pages; illustrated. C. V. Mosby Co., St. Louis, Mo., 1959. Price $6.75.

The Chemistry of Heredity, by *Stephen Zamenhof*, Ph. D. 106 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $4.25.

The Kinetics of Cellular Proliferation, edited by *Frederick Stohlman, Jr.*, M.D. 456 pages; illustrated. Grune & Stratton, New York, N.Y., 1959. Price $5.75.

Projective Psychology, Clinical Approaches to the Total Personality, edited by *Lawrence Edwin Abt* and *Leopold Bellak*. 485 pages; illustrated. Grove Press, Inc., New York, N.Y., 1959. Price $5.

Recent Advances in Cardiology, by *Terence East*, M.A., D.M., F.R.C.P., and *Curtis Bain*, M.C., D.M., F.R.C.P. 5th edition. 421 pages; illustrated. Little, Brown and Co., Boston, Mass., 1959. Price $10.

DISEASES OF MEDICAL PROGRESS, A Survey of Diseases and Syndromes Unintentionally Induced as the Result of Properly Indicated, Widely Accepted Therapeutic Procedures, by *Robert H. Moser*, B.S., M.D., Major, Medical Corps, U.S. Army, with a foreword by *F. Dennette Adams*, M.D. 131 pages. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $4.75.

THE CARE OF MINOR HAND INJURIES, by *Adrian E. Flatt*, M.A., M.D., F.R.C.S., with a foreword by *Carroll B. Larson*, M.D. 266 pages; illustrated. C. V. Mosby Co., St. Louis, Mo., 1959. Price $9.50.

AUTOMATIC VENTILATION OF THE LUNGS, by *William W. Mushin*, M.A., M.B., B.S., F.F.R.C.S., F.F.A.R.C.S., *L. Rendell-Baker*, M.B., B.S., F.F.A.R.C.S., and *Peter W. Thompson*, B.A., M.B., B. Chir., F.F.A.R.C.S., with chapters on Physics of Automatic Ventilators, by *W. W. Mapleson*, Ph. D., A. Inst. P. 349 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $10.50.

SURGICAL SERVICE GUIDE, by *Louis T. Palumbo*, M.D., M.S., F.A.C.S. 208 pages; illustrated. Year Book Publishers, Inc., Chicago, Ill., 1959. Price $6.

ANESTHESIA FOR INFANTS AND CHILDREN, by *Robert M. Smith*, M.D., with a foreword by *Robert E. Gross*, M.D. 418 pages; illustrated. C. V. Mosby Co., St. Louis, Mo., 1959. Price $12.

CHEMICAL QUANTITATION OF EPINEPHRINE AND NOREPINEPHRINE IN PLASMA, Their Plasma Concentration in Hypertension, Shock and Mental Disease, With Some Metabolic Studies, by *William Muir Manger*, B.S., M.D., Ph. D., *Khalil G. Wakim*, M.D., Ph. D., and *Jesse L. Bollman*, M.D. 389 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $11.50.

A SYNOPSIS OF SKIN DISEASES, by *Bethel Solomons*, Jun., M.A., M.D., F.R.C.P.I., 294 pages. Williams & Wilkins Co., Baltimore, Md., 1959. Price $6.75.

PEDIATRIC NEUROSURGERY, edited by *Ira J. Jackson*, M.D., M. Sc., F.A.C.S., F.A.C.A., and *Raymond K. Thompson*, M.D., F.A.C.S., with 24 contributors. 564 pages; illustrated. Charles C. Thomas, Publisher, Springfield, Ill, 1959. Price $16.50.

FIXED PARTIAL PROSTHESIS, by *Joseph E. Ewing*, D.D.S., F.A.C.S. 2d edition. 288 pages; illustrated. Lea & Febiger, Philadelphia, Pa., 1959. Price $8.50.

THE ANNUAL SURVEY OF PSYCHOANALYSIS, A Comprehensive Survey of Current Psychoanalytic Theory and Practice. Volume V, edited by *John Frosch*, M.D., and *Nathaniel Ross*, M.D. *Lottie M. Newman*, Editorial Assistant. 60[illegible] pages. International Universities Press, Inc., New York, N.Y., 1959. Price $12

UNITED STATES ARMY IN WORLD WAR II, The Technical Services. The Chemical Warfare Service: Organizing For War, by *Leo P. Brophy* and *George J. [illegible] Fisher*. Office of the Chief of Military History, Department of the Army, Washington, D.C., 1959. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Price $4.

BASIC PHYSICS IN RADIOLOGY, by *L. A. W. Kemp*, B. Sc., Ph. D., F. Inst. P., and *R. Oliver*, M. Sc., F. Inst. B., A.M.I.E.E. 329 pages. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $8.50.

A SYNOPSIS OF ANAESTHESIA, by *J. Alfred Lee*, M.R.C.S., L.R.C.P., M.M.S.A., F.F.A.R.C.S., D.A., 4th edition. 616 pages; illustrated. Williams & Wilkins Co., Baltimore, Md., 1959. Price $6.50.

RESUSCITATION OF THE UNCONSCIOUS VICTIM, A Manual for Rescue Breathing by *Peter Safar*, M.D., and *Martin C. McMahon*. 79 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $1.75.

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